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WAR MACHINE

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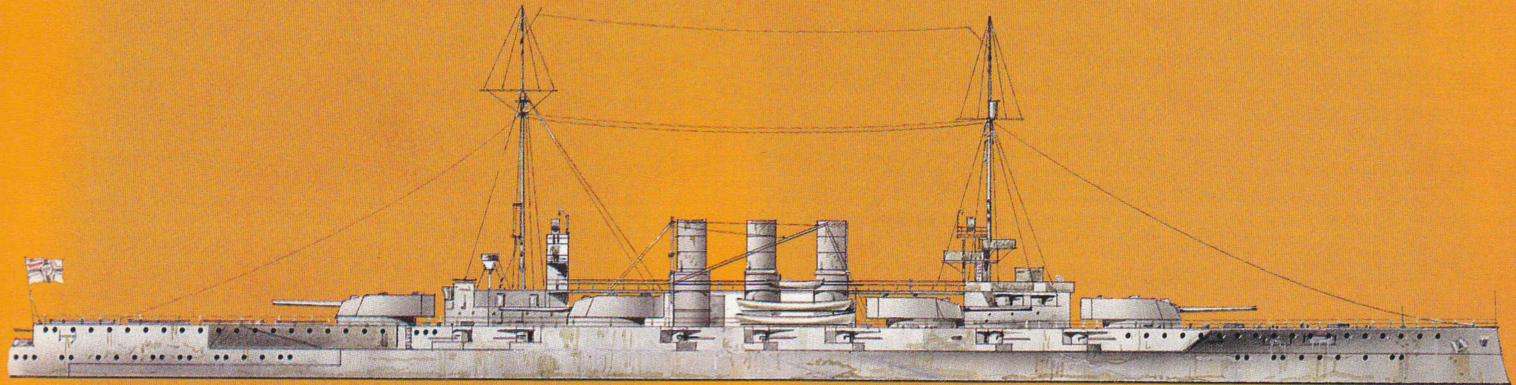

Development of Fire Control Systems

The Rise of the Dreadnought

The *Lion* in Action

Jutland

A fully illustrated guide to Battleships of World War I

WAR MACHINE

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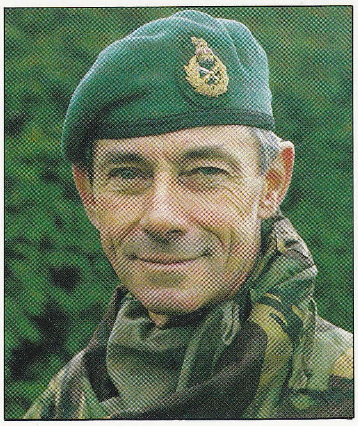

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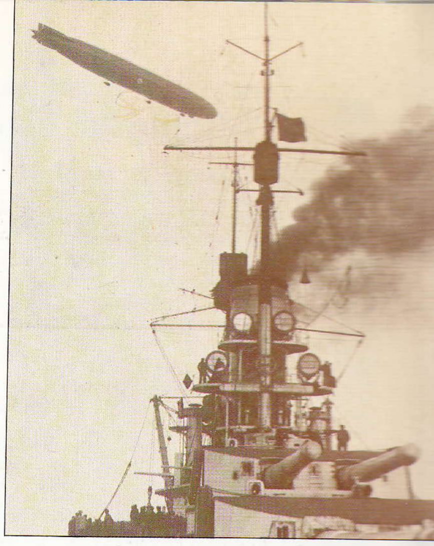
Battleships of World War 1



Looking forward on a 'Kaiser' class battleship in 1917. Though Zeppelins were used extensively by the Germans in co-operation with the High Seas Fleet, they were obviously still rare enough to cause much interest.

Of all the sights to stir the patriotic spirit in the years before World War I, it was the serried steel ranks of Dreadnoughts that most effectively symbolized military potency, and the possession of a strong fleet became a means to glorify the nation.

If it can be argued that only armies could win World War I, it is beyond doubt that navies could have lost it. To prosecute a war on such a scale meant, for the British in particular, continuous and guaranteed movement of men and materials which, in turn, demanded full control of the sea. Through this it was possible also to effectively deny the sea to the enemy; blockade could cut off the vital raw materials and foodstuffs in which he was not self-sufficient and, by its grinding remorselessness, gradually erode his will to resist.

Close blockade, as practised during the early 19th century, had been rendered impracticable by the submarine, the torpedo and the mine, so this 'front-line' function of the battleship had disappeared. The geographical advantages enjoyed by the UK, however, enabled distant blockade to be rigorously applied by comparatively weak and obsolete ships. These were buttressed by the full might of the Grand Fleet, its main strength lying at Scapa Flow to deter the German High Seas Fleet from either interfering with this slow strangulation or indulging more ambitious deep-sea adventures.

As it happened, however, the Kaiser hedged his cherished fleet with such suffocating operational restrictions that it existed largely as a fleet-in-being, tying down the numerically more powerful Royal Navy and offering battle only on its own terms. Perhaps the greatest disappointment of the battleship fleets was that in this war, during which they could really have justified themselves, they occupied their time largely cancelling out each other's existence. Numbers were important, the need to survive tempering boldness and originality in many commanders. In the end, even as with the French revolutionary navy of over a century before, insufficient real use robbed the High Seas Fleet of its sense of purpose, so that it drifted into deterioration and revolt.

Though, between them, the warring powers could boast many capital ships, few achieved much beyond those involved in the tiny arena of the North Sea. In retrospect it may be said that the Royal Navy, while retaining the Grand Fleet in its main role, could have used its large (and expendable) force of pre-Dreadnoughts far more adventurously in a variety of unorthodox ways.

A late sortie by the High Seas Fleet, probably in 1917 as the 'Bayern' class ship on the right has a mainmast and all have landed their torpedo nets. The Germans successfully preserved the greater part of their battle fleet as a 'fleet-in-being', tying down the superior strength of the British.

USA

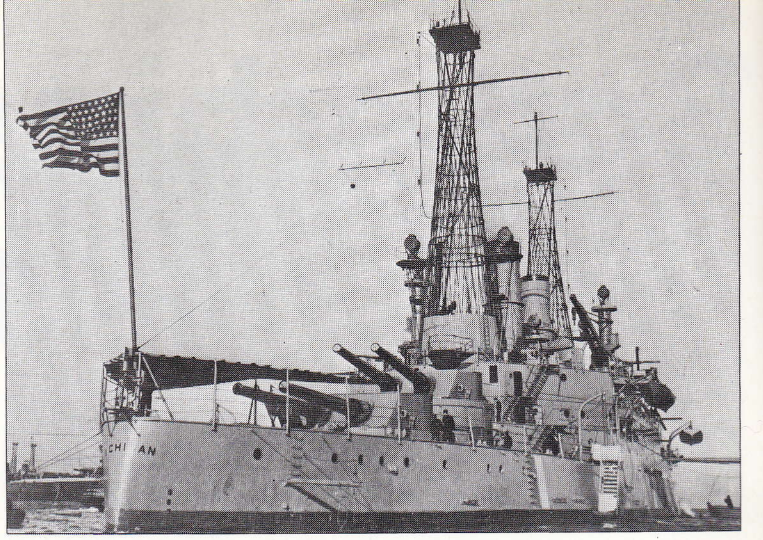
'Michigan' class

Had HMS *Dreadnought* not been built precisely when she was, it is conceivable that 'all-big-gun' ships would have been termed 'Michigans', this pair having been approved before the British ship and embodying all the principles of a heavy and homogeneous main battery. The USS **Michigan** and USS **South Carolina** were laid down after the *Dreadnought*, however, and took three years to construct compared with only one. A drawback of the design was that steam turbines were not available for propulsion, but their primary feature was their armament layout. Though the *Dreadnought* carried 10 305-mm (12-in) guns, only eight could be used in broadside as two turrets were sited in the waist. The 'Michigans' had only eight guns but, well before the arrangement became general, mounted them in twinned superfiring turrets at each end.

Sensibly, the Americans also shipped a secondary battery, albeit a lightweight one of 22 76-mm (3-in) guns but, for the greater part, behind protected casemates in the superstructure at a height where they could always be used.

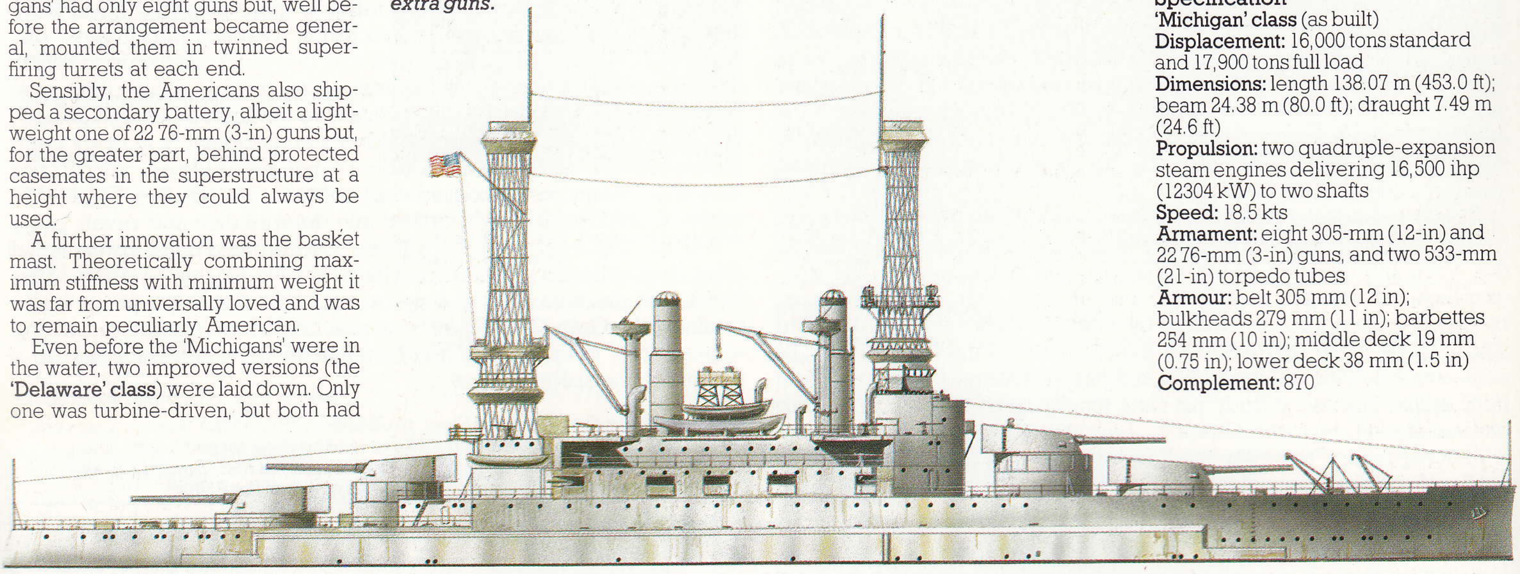
A further innovation was the basket mast. Theoretically combining maximum stiffness with minimum weight it was far from universally loved and was to remain peculiarly American.

Even before the 'Michigans' were in the water, two improved versions (the **'Delaware' class**) were laid down. Only one was turbine-driven, but both had an extra centreline main battery turret and the standard 127-mm (5-in) calibre was readopted for the secondary armament.



Boat booms and awnings rigged, the Michigan ***and a 'Delaware' class ship lie peacefully at anchor. First with superimposed turrets, she would also have been the first all-big-gun capital ship but for*** Dreadnought***'s rushed completion.***

Below: Initiated before Dreadnought***, but completed well afterwards, the 'Michigans' had all-superfiring main armament. This allowed all guns to fire on both beams, in contrast to the British vessel, which required two extra guns.***



Specification
'Michigan' class (as built)
Displacement: 16,000 tons standard and 17,900 tons full load
Dimensions: length 138.07 m (453.0 ft); beam 24.38 m (80.0 ft); draught 7.49 m (24.6 ft)
Propulsion: two quadruple-expansion steam engines delivering 16,500 ihp (12304 kW) to two shafts
Speed: 18.5 kts
Armament: eight 305-mm (12-in) and 22 76-mm (3-in) guns, and two 533-mm (21-in) torpedo tubes
Armour: belt 305 mm (12 in); bulkheads 279 mm (11 in); barbettes 254 mm (10 in); middle deck 19 mm (0.75 in); lower deck 38 mm (1.5 in)
Complement: 870

USA

'Pennsylvania' class

American 'post-Michigan' battleships added firepower in logical steps. The five-turret 'Delawares' and 'Floridas' thus developed into the six-turret 'Wyomings' of 1911. As all of it was sited on the centreline, this armament demanded a long ship with a large area to protect. In 1912, therefore, the trend was halted by a reversion to 10 guns in the 'New Yorks', though these increased the calibre from 305 to 356 mm (12 to 14 in). Again these were grouped in five turrets, but the following pair of 'Nevadas' had much improved protection at little penalty by adopting a four-turret arrangement with twins superfiring triples. It was then but a small step to ship four triples to give a broadside of 356-mm (14-in) guns in the **'Pennsylvania' class**. This layout was successful and retained in the following two classes to give a homogeneous seven-ship group, which was not outclassed until the introduction of the 406-mm (16-in) gun with the 'Colorados' of 1921. The 'Pennsylvanias' were both completed in 1916 as the USS ***Pennsylvania*** and USS ***Arizona***.

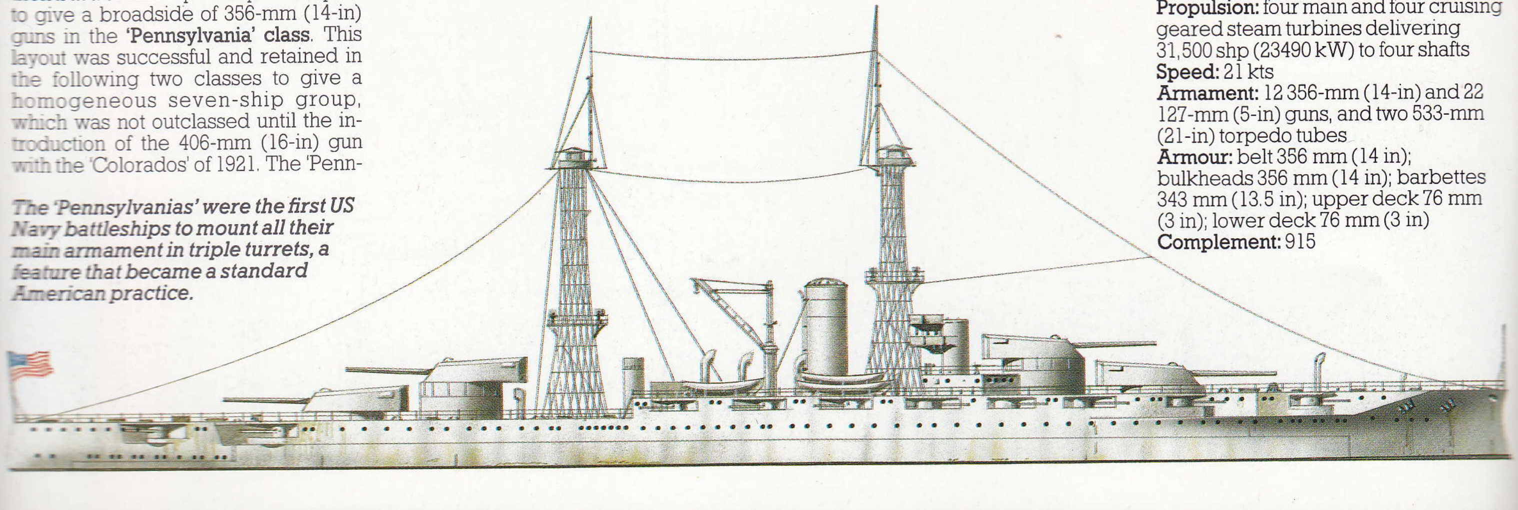
The 'Pennsylvanias' were turbine-driven but, in the 'New Mexico' class that followed them turbo-electric drive was introduced. Inadequacies in American heavy gear production was the overriding reason for this, the turbo-electric machinery requiring neither reduction nor reversing gear. Despite being heavy and expensive, however, the system had advantages in flexibility, with any shaft capable of being driven from any turbo generator. Further, propulsion motors could be sited well aft, shortening shafts and allowing improved standards of watertight integrity.

Starting their career with characteristic basket masts, small bridge structure and a generally uncluttered appearance, the 'Pennsylvanias' were remodelled between the wars, emerging almost unrecognizable with heavy tophamper, massive tripod masts and the paraphernalia of aircraft operation.

The *Arizona* was shattered by a magazine explosion during the Pearl Harbor attack; with her died nearly 1,200 crewmen. The *Pennsylvania*, further updated, obtained redress in several operations, notably as one of Admiral Oldendorf's gun line at the Surigao Strait; post-war she survived two Bikini nuclear tests and was finally expended as a bombing target.

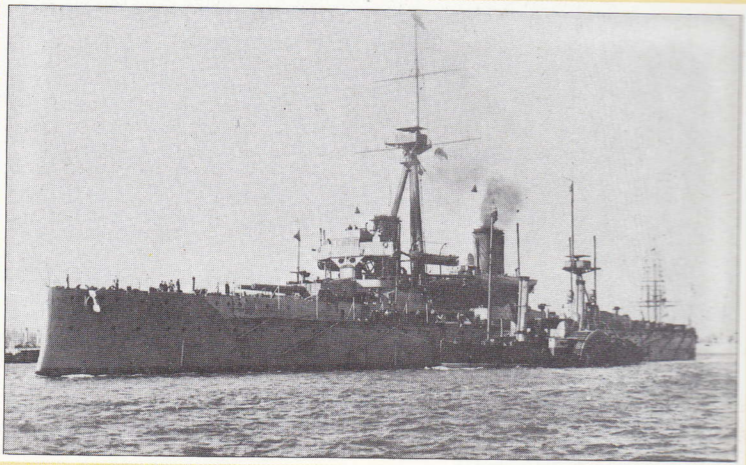
Specification
'Pennsylvania' class (as built)
Displacement: 31,400 tons standard and 33,000 tons full load
Dimensions: length 185.39 m (608.25 ft); beam 29.62 m (97.17 ft); draught 8.79 m (28.84 ft)
Propulsion: four main and four cruising geared steam turbines delivering 31,500 shp (23490 kW) to four shafts
Speed: 21 kts
Armament: 12 356-mm (14-in) and 22 127-mm (5-in) guns, and two 533-mm (21-in) torpedo tubes
Armour: belt 356 mm (14 in); bulkheads 356 mm (14 in); barbettes 343 mm (13.5 in); upper deck 76 mm (3 in); lower deck 76 mm (3 in)
Complement: 915

The 'Pennsylvanias' were the first US Navy battleships to mount all their main armament in triple turrets, a feature that became a standard American practice.



The Rise of the Dreadnought

The Russo-Japanese war in 1904-5 demonstrated to the world's naval thinkers the need for a radical change of emphasis in warship design. In most of the major maritime nations plans were being advanced, but it was Britain who gave the world the Dreadnought.



Dreadnought ***set new standards in capital ships – larger and faster, with 10 large guns of homogeneous calibre. In practice, her lack of secondary armament was a drawback and, despite her turbine propulsion, she proved too slow for the Grand Fleet, from which she was withdrawn in 1916.***

On Trafalgar Day, 1904, 63-year-old 'Jacky' Fisher was appointed First Sea Lord, embarking immediately on a series of fundamental changes that would take the Royal Navy from the somnolence of the long, lotus years of the 'Pax Britannica' to the battleworthiness demanded by a war that he saw as inevitable. Within a year the *Dreadnought* had been laid down, her concept the best of a series considered by his 'Committee on Designs'. Fisher claimed to have been refining the idea since 1900 when, as Commander-in-Chief Mediterranean, he had discussed it at length with William Gard, Chief Constructor at Malta.

Fisher was not alone. Professional publications of major naval powers were all familiar with the florid prose of the Italian Vittorio Cuniberti, whose theories cut little ice at home. His dream ship would be fast and carry the greatest number of the largest guns available, choosing her range to 'pour in a terrible converging fire' on any hapless battleship of the time.

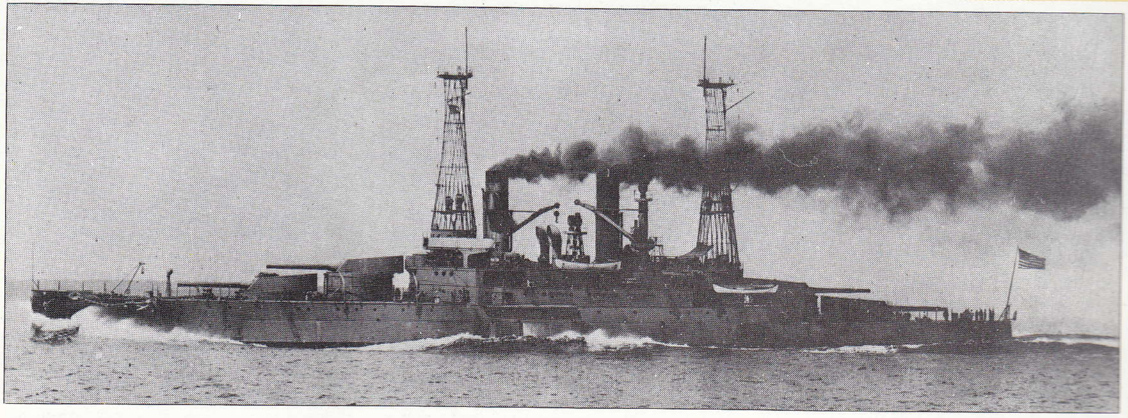
Having the world's largest fleet, the UK had no interest in rendering it obsolete by a significant advance, but the impetus came with the improving performance of both torpedoes and guns, forcefully demonstrated by previously unimagined engagement ranges during the Russo-Japanese War of 1904-5. Fisher's sense of urgency may also have been heightened by knowledge that the Americans were about to pre-empt him, the Congress approving plans for Admiral Sim's ideas in the two 'Michigans' early in 1905.

Because of its higher rate of fire and because more barrels could be carried, the 254-mm (10-in) gun was preferred by Fisher to the 305-mm (12-in) weapon but Admiral Bacon, a committee member, convinced him that fewer large guns, married to high speed, would lead to 'scientific and practical shooting'. Once accepted, this argument led directly to the daring adoption of the steam turbine, yet untried in the required power range, together with oil fuelling, that would demand the piercing of bulkheads on a far more modest scale than necessary in coal-fired ships.

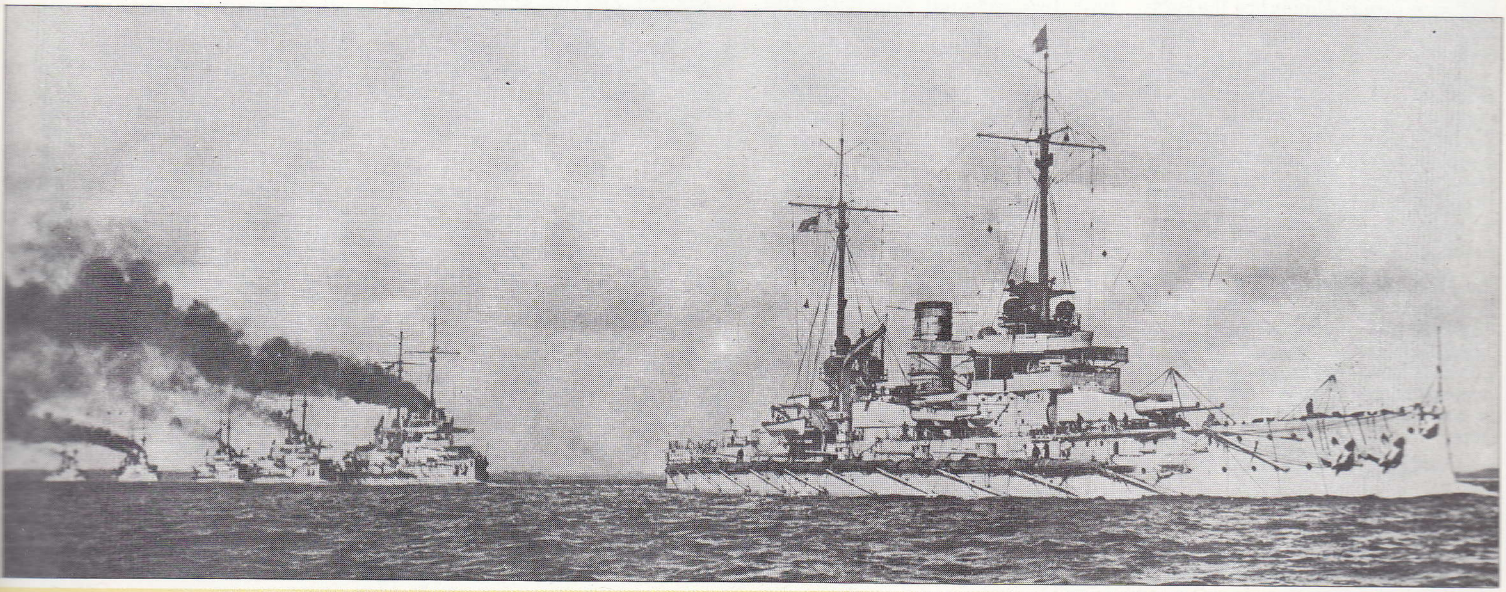
In HMS *Dreadnought* the Royal Navy acquired a ship that could steam reliably at high speed and which could fight its armament in all conditions. Firing arcs were good, but the layout reflected Fisher's obsession with chase-fire, tempered by the practical considerations of blast effects. A single major gun calibre simplified both magazine arrangements and fire control. The reasoning that resulted in the abandoning of a credible secondary battery was faulty, and rectified in subsequent classes.

The 'Dreadnought Committee' was tasked also with defining a super armoured cruiser, later to be termed the battle-cruiser. As a 30 per cent speed margin was sought over comparable battleships, the result was a large ship, packed with machinery and protected on a scale that was acceptable only when used against conventional armoured cruisers. Carrying the same 305-mm (12-in) main battery calibre as the *Dreadnought* herself, the first of these 'glass-jawed' monsters, HMS *Invincible*, was completed some 15 months later in March 1908.

Right: Though the main battery was better arranged than that of **Dreadnought**, ***the 'Michigans' retained reciprocating steam machinery. They were also coal-fired, which meant smoke at higher speeds, as shown by*** **South Carolina** ***making her full 18½ kts.***

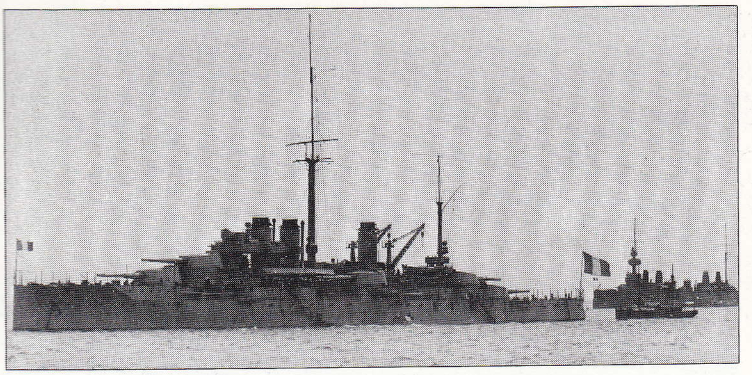


Below: The four 'Nassaus' were Germany's first Dreadnoughts, yet still contrived to look orthodox. By restricting the main battery calibre to only 280 mm (11 in), six twin turrets could be carried, two of them on either beam. Typical German features are the large gooseneck boat cranes and uncased funnel tops.



FRANCE

'Courbet' class

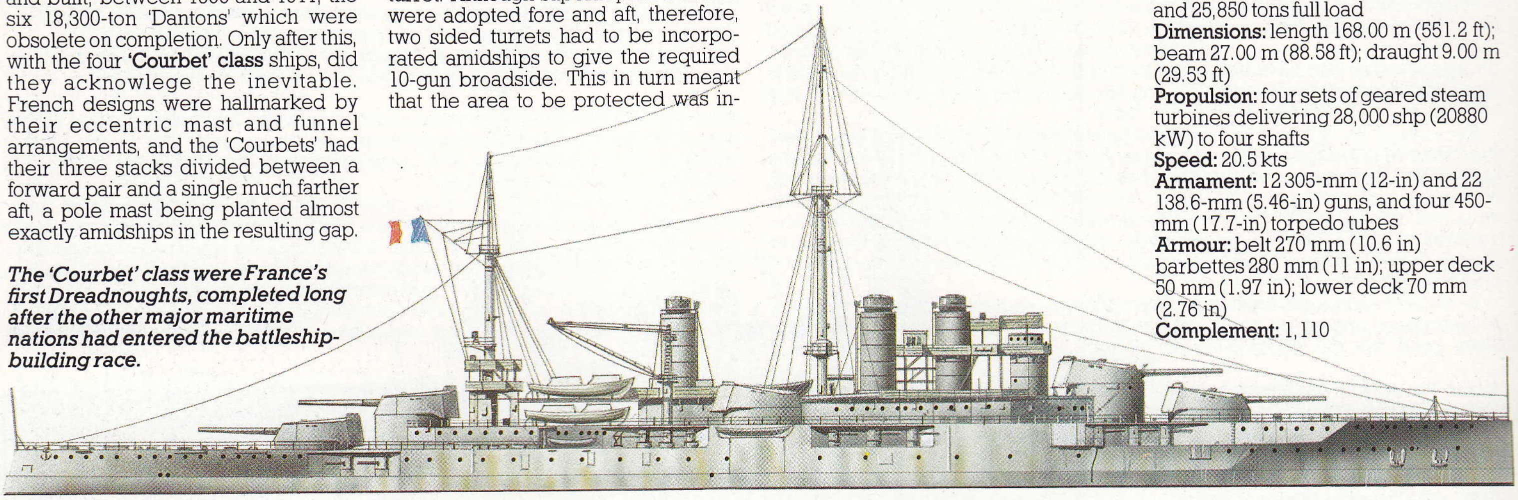


In spite of the highly individual funnel layout, the French 'Courbets' were not unpleasing in appearance as first built. In the background is an 'Aube' class armoured cruiser completed a decade earlier.

Through a combination of backward naval thought and an inadequate industrial base, France for a while ignored the Dreadnought revolution and built, between 1906 and 1911, the six 18,300-ton 'Dantons' which were obsolete on completion. Only after this, with the four **'Courbet' class** ships, did they acknowlege the inevitable. French designs were hallmarked by their eccentric mast and funnel arrangements, and the 'Courbets' had their three stacks divided between a forward pair and a single much farther aft, a pole mast being planted almost exactly amidships in the resulting gap. As the mast carried no control top, there was no valid reason for its siting, particularly as the overall layout was thus incapable of taking a centreline turret. Although superimposed turrets were adopted fore and aft, therefore, two sided turrets had to be incorporated amidships to give the required 10-gun broadside. This in turn meant that the area to be protected was increased and, as the class was already notable for its protected area (the armour being continued unusually low on the hull) the result had to be on the thin side. Torpedo attack had always figured largely in French thought, and the 22 casemated secondary guns were selected for rate of fire rather than weight of metal. Launched in 1911-2, the ships were the ***Courbet*, *France*, *Jean Bart*** and ***Paris***.

The *France* was wrecked off Quiberon in 1922, and the remainder were remodelled soon after this. Externally the forward uptakes were paired into a single, larger casing (except in the *Paris*) and a massive tripod foremast with a control top was added over the bridge. This layout, if adopted originally, would have allowed an all-centreline main battery, which was not seen until the following three **'Provence' class** units which, carrying one turret less for the same broadside, could also have the calibre increased to 340 mm (13.4 in).

During the rapid German advance in 1940, both *Courbet* and *Paris* saw brief bombardment action but then shared the fate of many major French units, wasted through the double loyalties of an occupied land.



The 'Courbet' class were France's first Dreadnoughts, completed long after the other major maritime nations had entered the battleship-building race.

Specification

'Courbet' class (as built)
Displacement: 23,200 tons standard and 25,850 tons full load
Dimensions: length 168.00 m (551.2 ft); beam 27.00 m (88.58 ft); draught 9.00 m (29.53 ft)
Propulsion: four sets of geared steam turbines delivering 28,000 shp (20880 kW) to four shafts
Speed: 20.5 kts
Armament: 12 305-mm (12-in) and 22 138.6-mm (5.46-in) guns, and four 450-mm (17.7-in) torpedo tubes
Armour: belt 270 mm (10.6 in) barbettes 280 mm (11 in); upper deck 50 mm (1.97 in); lower deck 70 mm (2.76 in)
Complement: 1,110

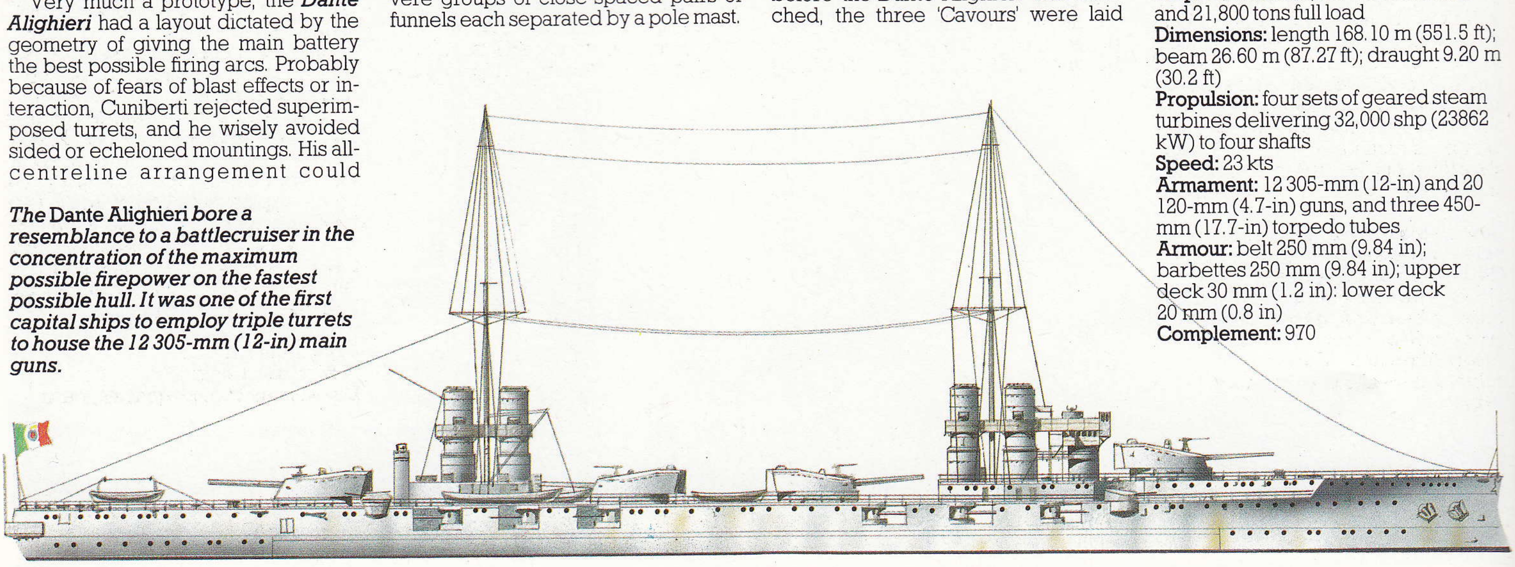
ITALY

'Dante Alighieri' class

As Vittorio Cuniberti was one of the earliest protagonists of the 'all-big-gun' capital ship, it is not surprising that Italy's first Dreadnought was a pure embodiment of his ideas. These espoused the greatest possible number of the largest available guns, carried on a fast hull, thus enabling the ship to decide the range at which to pour in an overwhelming fire, the large number of barrels compensating for their slow rate of fire.

Very much a prototype, the ***Dante Alighieri*** had a layout dictated by the geometry of giving the main battery the best possible firing arcs. Probably because of fears of blast effects or interaction, Cuniberti rejected superimposed turrets, and he wisely avoided sided or echeloned mountings. His all-centreline arrangement could accommodate only four turrets on the length, so he adopted the then advanced concept of the triple turret, copied immediately afterwards by the Austro-Hungarians for their 'Viribus Unitis' class battleships. The forward turret was sited on a raised forecastle, two more were placed amidships and one was located aft, leaving space for only two vestigial superstructure blocks. Kept axially as short as possible, these comprised mainly two severe groups of close-spaced pairs of funnels each separated by a pole mast. While the resultant firing arcs were exceptionally good, the bridge structure was impractically small and low, and no control top was fitted. The layout also demanded an immense area of protection which thus had to be on the thin side and which would have made the ship vulnerable to attack by a more orthodox Dreadnought.

Modifications during the 1920s increased her bridge size and added a large tripod foremast with top. Even before the *Dante Alighieri* was launched, the three 'Cavours' were laid down, their design tempering some of Cuniberti's more extreme features. The earlier eccentric paired funnels were, for instance, combined in common casings, and superimposed turrets (twins over triples at each end) allowed an increase of one barrel while reducing the number of amidships turrets to only one.



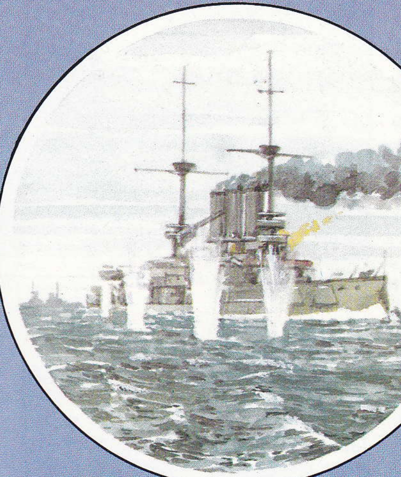
The* Dante Alighieri *bore a resemblance to a battlecruiser in the concentration of the maximum possible firepower on the fastest possible hull. It was one of the first capital ships to employ triple turrets to house the 12 305-mm (12-in) main guns.

Specification

'Dante Alighieri' class (as built)
Displacement: 19,500 tons standard and 21,800 tons full load
Dimensions: length 168.10 m (551.5 ft); beam 26.60 m (87.27 ft); draught 9.20 m (30.2 ft)
Propulsion: four sets of geared steam turbines delivering 32,000 shp (23862 kW) to four shafts
Speed: 23 kts
Armament: 12 305-mm (12-in) and 20 120-mm (4.7-in) guns, and three 450-mm (17.7-in) torpedo tubes
Armour: belt 250 mm (9.84 in); barbettes 250 mm (9.84 in); upper deck 30 mm (1.2 in): lower deck 20 mm (0.8 in)
Complement: 970

Development of Fire Control Systems

The advance in fire control systems was made necessary by the rapidly increasing performance of warships and the unprecedented engagement ranges possible with the new, powerful armament then being fitted.



The Battle of Jutland saw the German and British methods of rangefinding and fire control meet head-on. In rangefinding terms, the German navy was superior; the British were much slower to find the range, but had a more effective fire control system. The main indications of accuracy were the enormous splashes made by the main armament. From the main top, a telescopic view immediately showed whether a salvo was over, under or, as shown here, straddling the range of the target.

Capital ships toward the end of the 19th century were carrying fewer large guns, so every shot needed to tell. Improved weapons and projectile ballistics also offered consistency and predictability, which enabled forward-thinkers to approach gunnery in a more scientific manner. To hit the enemy before he could hit you demanded centralized gun control from a director, equipped with the means of measuring the range and bearing of the target, together with a prediction of where that target was likely to be after the calculated time of flight of the projectiles.

In 1891 Watkins, using precision optics and telephonic communication, updated the old sailing navy method of measuring range through taking the horizontal angles to the target from the known length of baseline of one's own ship. The system remained vulnerable, however, and accurate only wide on the beam, and was soon superseded by Barr's optical rangefinder which, though of only 1.37-m (4.5-ft) baseline, enabled a single observer to measure range on any bearing.

The target's course and speed could be estimated after a period of observation, and then combined with one's own course and speed to give a firing solution, this having to be modified by other variables such as wind speed and direction. Competitions stimulated the development of instruments to speed the process so, for instance, in 1902 the Dumaresq was introduced, predicting rates of change in target range and bearing. This was followed by the Range Clock, which gave predicted ranges directly and then the complex Dreyer Fire Control Table, which relied on extremely accurately-cut gearing to mix a variety of input variables, the result of which was elevation and training settings that could be transmitted to each gun turret. Once all of these had reported ready, a central firing key was closed to loose a salvo simultaneously.

Practice formed this salvo into a tight group, and fall of shot relative to the target was spotted from the high control top so that corrections could be signalled (up or down, left or right) until subsequent salvoes achieved a 'straddle'.

Gunnery in the Victorian navy envisaged typical engagements at ranges not exceeding 2750 m (3,000 yards). Enthusiasts such as 'Jacky' Fisher and Percy Scott changed all this, firing the fleet with a spirit of innovation and competition for challenge trophies. Scott, for instance, daily exercised his gunners with what he termed his 'Dotter', simulating ship movement and firing without the expenditure of ammunition. His commands, HMS *Scylla* and HMS *Terrible*, broke all gunnery records in their time.

Extensive trials on specialized test ranges, followed by regular live battle practices, enabled ships to calibrate their weapons and to prove them in realistic conditions. By 1912, ranges of 13715 m (15,000 yards) were not considered excessive.

American and German practice was generally behind that of the British at this time, but ran roughly parallel. The Germans, however, did have the benefit of superb long-based stereoscopic rangefinders which, in the right hands, could get the range far more rapidly than the well-tried British method of using ranging salvoes. Experience was to show that this difference could be crucial to the outcome of an action.

JAPAN

'Kongo' class

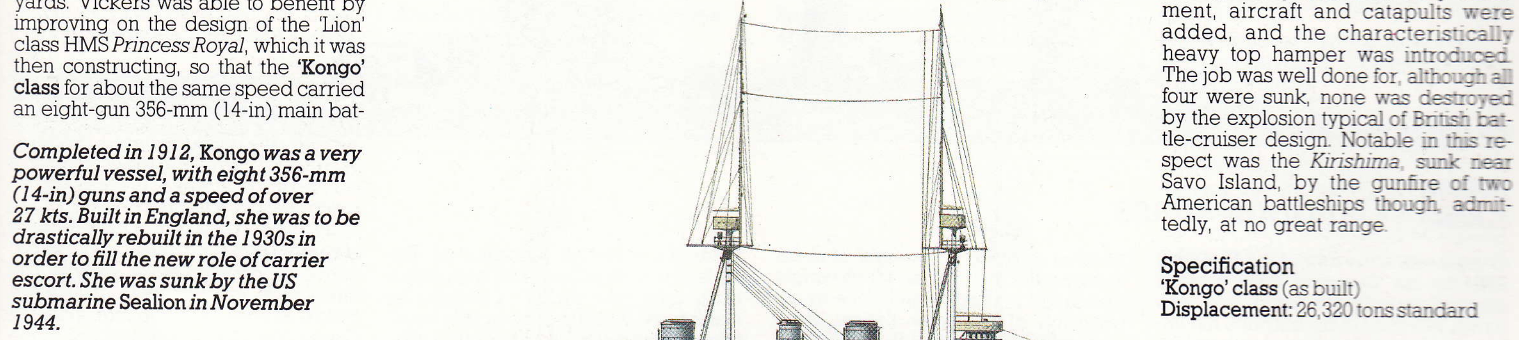
Experience in its recent war with the Russians had shown the Japanese navy the value of superior speed to dictate the course of an action, and the introduction of the battle-cruiser by the British soon after this war caused much interest. Though lacking the necessary expertise, the Japanese required four, ordering the lead ship from Vickers and acquiring the necessary technical support to build three sisters in home yards. Vickers was able to benefit by improving on the design of the 'Lion' class HMS *Princess Royal*, which it was then constructing, so that the **'Kongo' class** for about the same speed carried an eight-gun 356-mm (14-in) main battery in place of 10 343-mm (13.5-in) guns, and with better protection. As a result, HMS *Tiger* was built as an anglicized ***Kongo***, the latter still looking very British in spite of clipper bow and round-section funnels.

The *Kongo*'s three sisters were built in separate Japanese yards and in very creditable times, the ***Hiei*** being completed like the *Kongo* in 1912, and the ***Haruna*** and ***Kirishima*** in 1913. They varied only in detail. In the 1920s, with severe treaty limits on new construction, all four were thoroughly rebuilt. Their light horizontal protection was thickened and anti-torpedo bulges added. The latter addition reduced their speed by about 2 kts despite reboilering.

During the 1930s the Japanese navy was developing its ideas on fast carrier groups and, requiring high speed heavy escorts, again took the 'Kongos' in hand for remodelling. To improve their lines, their length was increased by about 8 m (26.25 ft) and the original installed power was more than doubled to achieve a 30-kt speed. As a result of advances in machinery technology, this was achieved with a substantial cut in weight.

Extra elevation improved ranges for both primary and secondary armament, aircraft and catapults were added, and the characteristically heavy top hamper was introduced. The job was well done for, although all four were sunk, none was destroyed by the explosion typical of British battle-cruiser design. Notable in this respect was the *Kirishima*, sunk near Savo Island, by the gunfire of two American battleships though, admittedly, at no great range.

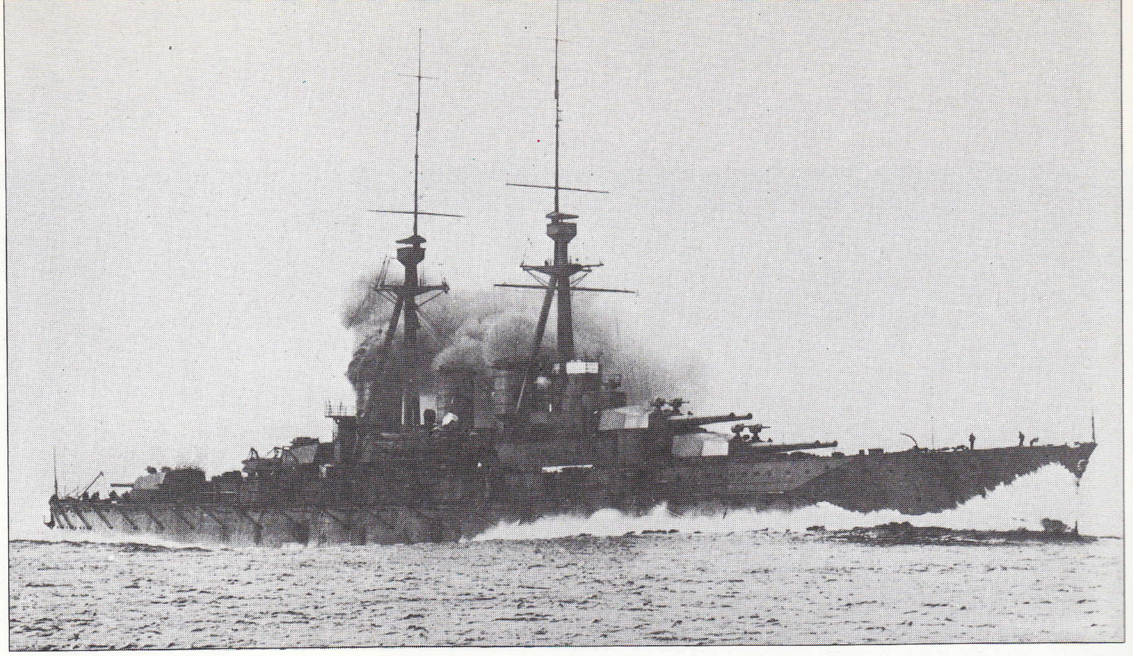
Specification
'Kongo' class (as built)
Displacement: 26,320 tons standard



Completed in 1912, Kongo *was a very powerful vessel, with eight 356-mm (14-in) guns and a speed of over 27 kts. Built in England, she was to be drastically rebuilt in the 1930s in order to fill the new role of carrier escort. She was sunk by the US submarine* Sealion *in November 1944.*

'Kongo' class (continued)

and 27,500 tons full load
Dimensions: length 214.70 m (704.4 ft); beam 28.00 m (91.8 ft) draught 8.40 m (27.6 ft)
Propulsion: four sets of geared steam turbines delivering 64,000 shp (47725 kW) to four shafts
Speed: 27.5 kts
Armament: eight 356-mm (14-in) and 16 152-mm (6-in) guns, and eight 533-mm (21-in) torpedo tubes
Armour: belt 203 mm (8 in); bulkheads 230 mm (9 in); barbettes 254 mm (10 in); deck 51 mm (2 in)
Complement: 1,221



Epitomizing the grace and power of the battlecruiser is the Japanese **Kongo** ***soon after completion. She was built in Britain as a model for three home-built copies, but her design was so successful that it formed the basis of the British*** **Tiger.**

JAPAN

'Fuso' class

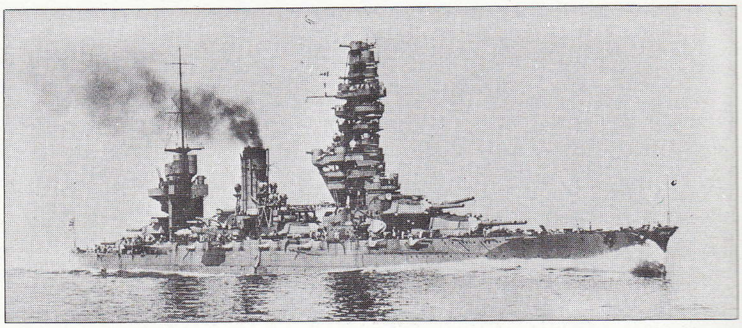
Launched in 1914-5 the two **'Fuso' class** battleships ***Fuso*** and ***Yamashiro*** were contemporaries of the American 'Nevadas' and came between the British 'Iron Dukes' and 'Queen Elizabeths'. The 10-gun broadsides of the two former classes were increased by two further barrels but, lacking experience of constructing triple turrets, the Japanese adopted six centreline twin mountings which, like those in the American 'Wyomings', demanded a long hull. Except for the odd little pairs of 'Satsumas' and 'Kawachis', the Japanese had had no experience of Dreadnought battleship design and construction, and the almost cruiser-like 'Fusos' echoed this with their low, clean lines. Fragility, however, was only apparent as they carried a heavy punch on a well-protected and subdivided hull, turbine-driven for 23 kts. For the first time, most gear was home-built.

As with so many battleships of this era, the 'Fusos' experienced a comparatively uneventful World War I, followed by a period of drastic reconstruction preceding a World War II of hectic activity. Thus in the 1930s they were extensively remodelled, being lengthened by 7.5 m (24.6 ft) to take advantage of a more powerful but lighter set of machinery, with oil firing. Main and secondary armaments had their ranges improved by increased elevation, horizontal protection was thickened against long-range plunging fire, and anti-torpedo bulges were added. Externally the forward funnel, tripod and bridgework made way for the extraordinary pagoda-like construction that was to become such a Japanese trademark, a structure that grew ever more complex with time.

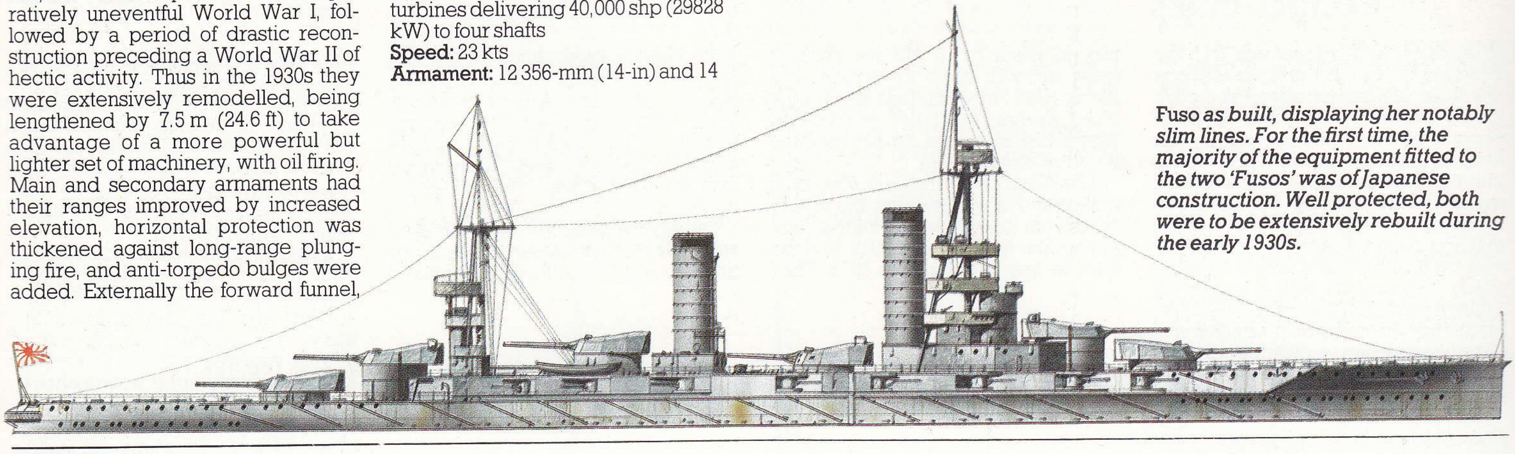
Despite this thorough remoulding, World War II saw the 'Fusos' (like the *Ise* and *Hyuga*) threatened post-Midway with conversion to hybrid aircraft-carriers. They avoided this further surgery only to be sacrificed together in the dark waters of the Surigao Strait, running the gauntlet to throw themselves at the massed guns of Admiral Oldendorf's battle line in a hopeless attempt to penetrate to Leyte Gulf.

Specification

'Fuso' class (as built)
Displacement: 30,600 tons standard and 31,000 tons full load
Dimensions: length 205.21 m (673.25 ft); beam 28.73 m (94.25 ft); draught 8.69 m (28.5 ft)
Propulsion: four sets of geared steam turbines delivering 40,000 shp (29828 kW) to four shafts
Speed: 23 kts
Armament: 12 356-mm (14-in) and 14 152-mm (6-in) guns, and six 533-mm (21-in) torpedo tubes
Armour: belt 305 mm (12 in); bulkheads 305 mm (12 in); barbettes 203 mm (8 in); upper deck 32 mm (1.25 in); lower deck 51 mm (2 in)
Complement: 1,195



Everybody's idea of the archetypal Japanese battleship, the **Fuso** ***is seen here following her 1933 rebuilding. Note how the six centreline turrets break the superstructure into three distinct masses. At this stage, she still carried an aircraft catapult on the roof of 'C' turret, abaft the 'pagoda'.***



Fuso ***as built, displaying her notably slim lines. For the first time, the majority of the equipment fitted to the two 'Fusos' was of Japanese construction. Well protected, both were to be extensively rebuilt during the early 1930s.***

UK

'Canopus' class

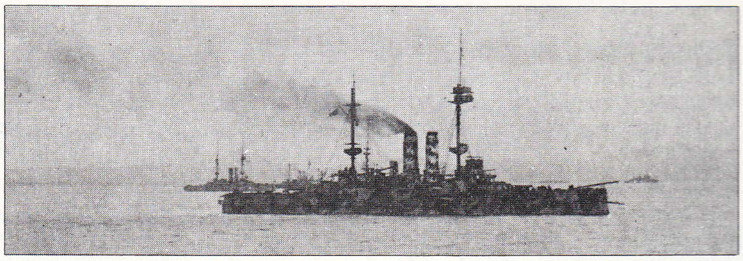
Completed at the end of the Victorian era, the six **'Canopus' class** typified contemporary British battleships, with a twin 305-mm (12-in) barbette mounting at either end and a secondary 152-mm (6-in) armament arranged in protected casemates along each side. They had been designed particularly with the China station in mind, and they needed a restricted draught in order to transit the Suez Canal. Much weight was saved in the design by the incorporation of the new Krupp steel armour which afforded the same protective qualities on only two-thirds the thickness of the Harvey armour in the earlier and similarly sized 'Majestic' class ships. A further weight-saving measure was the omission of the underwater sheathing and coppering then still customary. Propulsion machinery was the universally-used triple-expansion reciprocating engine, but a 2-knot advantage was gained over the 'Majestics' by the adoption of the water-tube boiler which, size for size, had a far larger steam-raising surface and could, therefore, develop more energy. The three units completed in 1900 were HMS ***Canopus***, HMS ***Goliath*** and HMS ***Ocean*** (the latter two being lost in the Dardanelles in 1915), while the three completed in 1901 were HMS ***Glory***, HMS ***Vengeance*** and HMS ***Albion***.

Though the Royal Navy in general

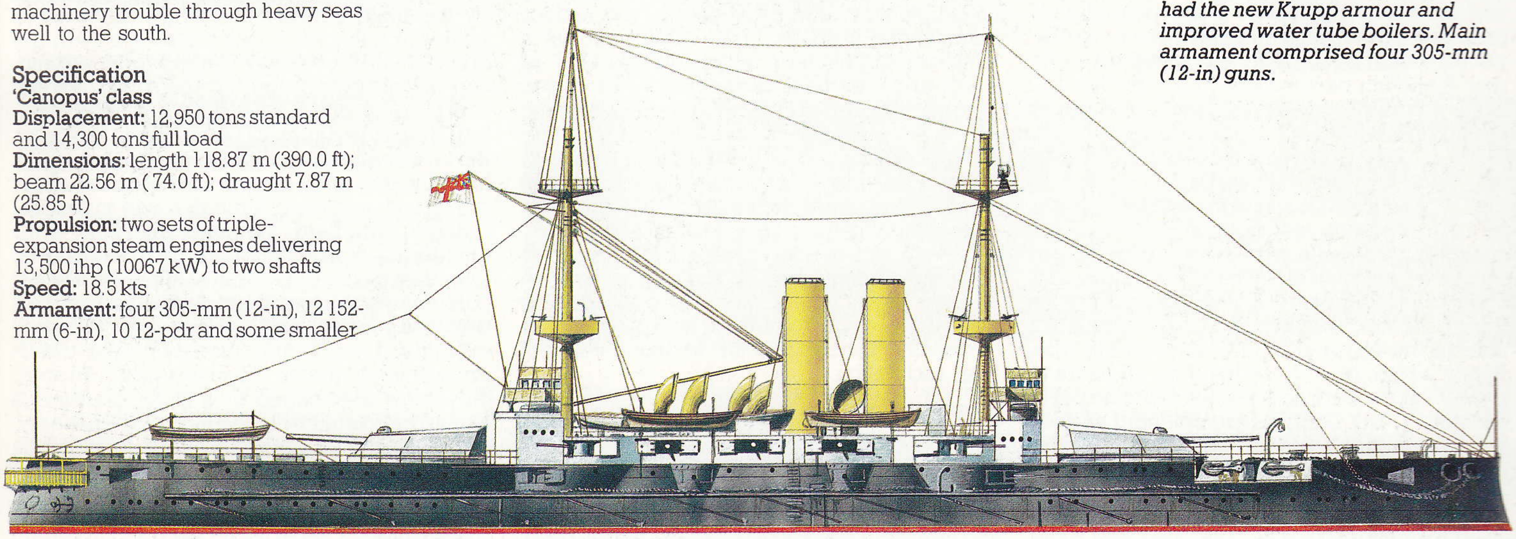
greatly underutilized the reserve of strength that it possessed in its older battleships, the 'Canopus' class had its share of action. Comprising the coherent 8th Battle Squadron of the Channel Fleet at the outbreak of war, the ships were rapidly and widely dispersed, *Canopus* going to the South American station. With von Spee's squadron coming eastward across the Pacific, Admiral Cradock took a scratch collection of ships to intercept him. The result was the disaster off Coronel on 1 November 1914. The *Canopus* was not involved in the action, labouring with machinery trouble through heavy seas well to the south.

Specification
'Canopus' class
Displacement: 12,950 tons standard and 14,300 tons full load
Dimensions: length 118.87 m (390.0 ft); beam 22.56 m (74.0 ft); draught 7.87 m (25.85 ft)
Propulsion: two sets of triple-expansion steam engines delivering 13,500 ihp (10067 kW) to two shafts
Speed: 18.5 kts
Armament: four 305-mm (12-in), 12 152-mm (6-in), 10 12-pdr and some smaller guns, and four 457-mm (18-in) torpedo tubes
Armour: belt 152 mm (6 in) amidships; transverse bulkheads 254-305 mm (10-12 in); barbettes 305 mm (12 in); upper deck 25 mm (1 in); lower deck 51 mm (2 in)
Complement: 680

Right: Though obsolete, the Royal Navy's pre-Dreadnoughts, such as the 'Canopus' class, still played very active roles.



Left: Last British battleships of the Victorian era, the 'Canopus' class had the new Krupp armour and improved water tube boilers. Main armament comprised four 305-mm (12-in) guns.



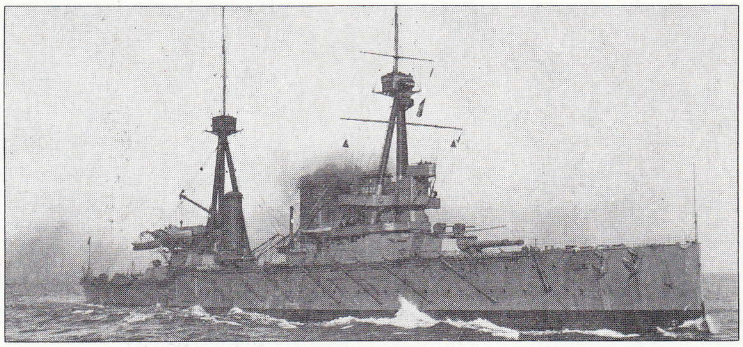
UK

'Invincible' class

As the world's first battle-cruisers, the three **'Invincible' class** ships marked a real revolution in warship development. The first of the class, HMS ***Inflexible***, was laid down only days before the *Dreadnought* was launched but, where the latter represented logical (if sudden) progression, the newcomers were of an entirely new breed. All major fleets operated armoured cruisers, some of which were comparable with smaller contemporary battleships. Admiral Fisher's brainchildren were to make these their natural prey, being able to sacrifice protection to mount a Dreadnought-scale armament on a Dreadnought-scale hull packed with machinery for unprecedented speed. Used properly, the battle-cruisers would use their speed and range to force or decline action as circumstance demanded. All three units were completed in 1908, the other two being HMS ***Indomitable*** and HMS ***Inflexible***.

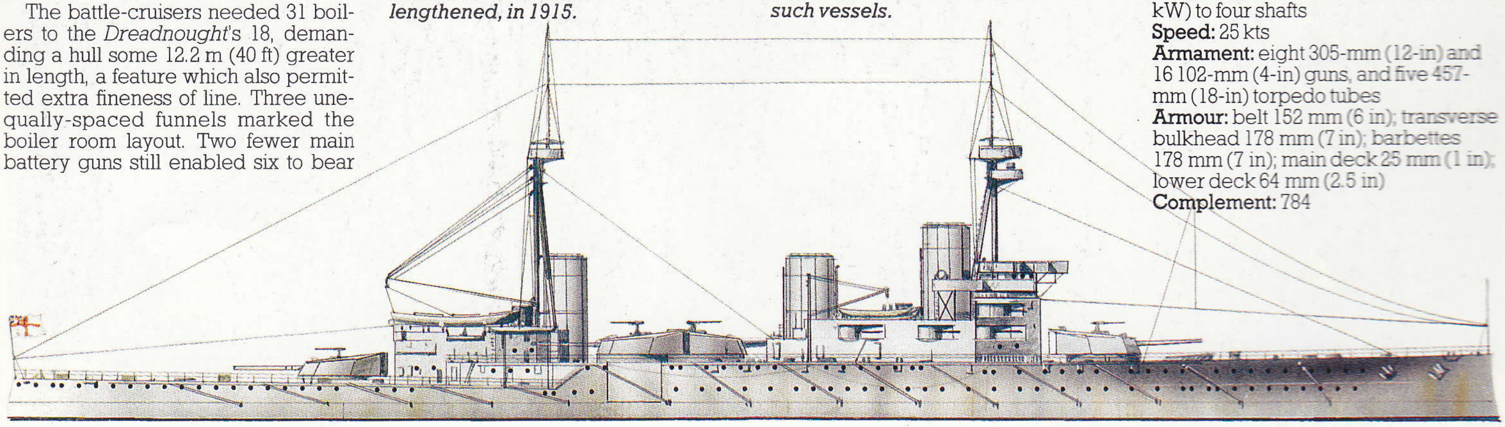
The battle-cruisers needed 31 boilers to the *Dreadnought*'s 18, demanding a hull some 12.2 m (40 ft) greater in length, a feature which also permitted extra fineness of line. Three unequally-spaced funnels marked the boiler room layout. Two fewer main battery guns still enabled six to bear on any target, enough to counter any armoured cruiser, whose scale of protection was also logically adopted.

Admiral Beatty's dramatic intervention at the Heligoland Bight fracas and Admiral Sturdee's destruction of the two 'Scharnhorsts' (among the finest armoured cruisers afloat) at the Battle of the Falklands confirmed the soundness of Fisher's ideas, which had worked in these instances through correct application. With the offensive doctrine inbred to the Royal Navy, however, it was only a matter of time until these enormous ships had their glass jaws broken by something out of their class. This occurred with horrifying finality at Jutland, when three battle-cruisers, of different classes but including the *Invincible*, were destroyed by magazine explosions caused by hits inflicted at medium range. Further protection was worked in after the battle, but the reputation was shattered and the battle-cruiser's brief day had already reached its evening.



Above: This photograph shows the smoke problem that caused Invincible's forefunnel to be lengthened, in 1915.

Below: Designed to combat armoured cruisers, the 'Invincible' class was armoured against fire from such vessels.



Specification
'Invincible' class
Displacement: 17,400 tons standard and 20,100 tons full load
Dimensions: length 175.56 m (576.0 ft); beam 23.93 m (78.5 ft); draught 7.77 m (25.5 ft)
Propulsion: four sets of geared steam turbines delivering 41,000 shp (30574 kW) to four shafts
Speed: 25 kts
Armament: eight 305-mm (12-in) and 16 102-mm (4-in) guns, and five 457-mm (18-in) torpedo tubes
Armour: belt 152 mm (6 in); transverse bulkhead 178 mm (7 in); barbettes 178 mm (7 in); main deck 25 mm (1 in); lower deck 64 mm (2.5 in)
Complement: 784

The *Lion* in Action

Embodying all the strengths and weaknesses of Fisher's battlecruiser concept,* Lion *was every inch a thoroughbred. Fast and powerful, but vulnerable to fire from heavy vessels, the sight of* Lion *at the head of Beatty's battlecruiser fleet was a stirring sight which disguised the basic frailty of high speed, lightly armoured vessels.

The magnificent HMS *Lion* was the warhorse of David Beatty, the impetuously courageous genius commanding the Grand Fleet's Battle-Cruiser Squadron. Like all of her kind she carried a punch that could crack a battleship, yet was perilously vulnerable to any plunging return fire. The deficiencies of such battle-cruisers were recognized and accepted as the type could not be used effectively by the cautious, and caution was one word that Beatty never learned.

As a rear admiral, Beatty had been appointed by Churchill in March 1913 and, in the 17 months remaining to the outbreak of war he had infused a real fighting spirit into the squadron with endless gunnery exercises conducted at previously unimagined ranges and speeds. It was as well, for Beatty's battle-cruisers were to be involved in every action of note in the North Sea. In a letter to his wife, Beatty wrote that 'We've lived for 40 years in peace and comfort, and now we are to be put to the test . . . My Captains are splendid and not easily rattled. Whatever comes, the battle-cruisers will give a good account of themselves.' How right he was.

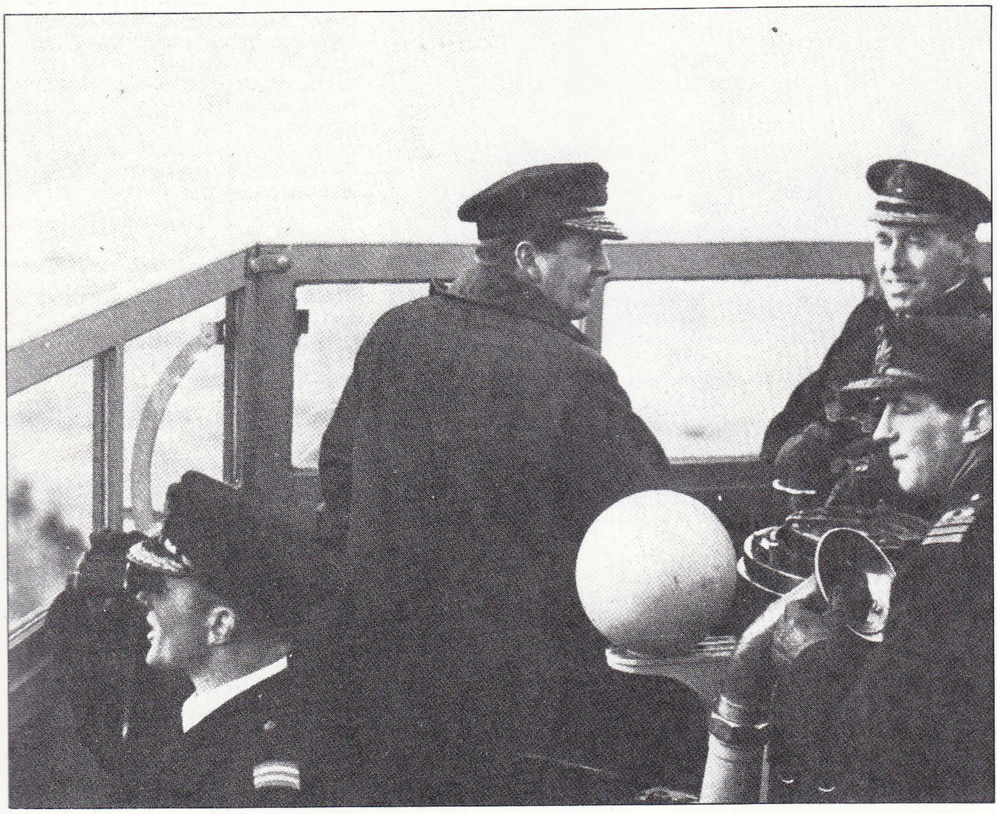
With the war not yet a month old, Commodore Tyrwhitt's Harwich Force was sent deep into the Heligoland Bight to disrupt and destroy any of the enemy light forces that conducted regular patrols. The Harwich Force was itself surprised, several enemy light cruisers arriving unexpectedly and pressing it hard in a very confused action in poor visibility. Thus caught on the Germans' very doorstep, Tyrwhitt called for assistance. He knew that two battle-cruisers from the Humber were available, but had not been informed of the decision of Admiral Jellicoe, the commander-in-chief, to back these with Beatty's force and Commodore Goodenough's six light cruisers. These were only 65 km (40 miles) from Heligoland and neither commander hesitated. Like the cavalry in a Western drama they surprised Tyrwhitt as much as his tormentors by their entry. Three German light cruisers were sunk, SMS *Ariadne* by the *Lion* herself with three 343-mm (13.5-in) salvoes at barely 4575 m (5,000 yards). Speedily withdrawing before the enemy's heavy forces could cross their tide-bound bars, the British found public acclaim awaiting them but, in truth, it had been a shambles of an encounter, unco-ordinated and poorly planned. Only Beatty's instant acceptance of risk had lifted it from an untidy skirmish to a naval event, doing wonders in the process for the morale of both fleet and nation.

German raid

In December 1914, two of Jellicoe's battle-cruisers were sent south, repeating the exercise on von Spee at the Falklands. The Squadron now had enormous prestige (yet could still attract petty official displeasure at their rate of ammunition expenditure!) but were about to be more severely tested.

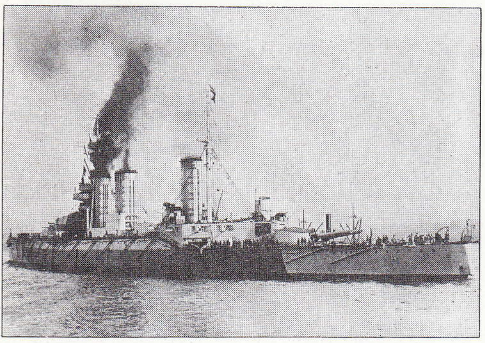
Now all too aware of the detachment of the two battle-cruisers, the Germans seized their chance of a bombardment raid on the English east coast, using the battle-cruisers of Beatty's able counterpart, Admiral Hipper. By this provocation, it was hoped to lure Beatty's reduced force out in pursuit, to be ambushed in turn and destroyed by the main body of the High Seas Fleet which was to render distant support. Decoded radio intercepts had, however, warned the British of the general form of the operation and Beatty sailed to intercept, supported by Vice Admiral Warrender's 2nd Battle Squadron and two cruiser squadrons. In the winter pre-dawn darkness, Warrender's destroyers ran into the German main body which, timidly assuming that it was about to encounter the whole Grand Fleet, turned away. Typically, Beatty gave chase, his four battle-cruisers (led by the *Lion*) actually pursuing a force of 22 battleships, two armoured cruisers, seven light cruisers and 54 destroyers! This farcical situation was ended abruptly by the news that both Scarborough and Hartlepool were being shelled. Hipper had split his battle-cruiser force for the task and was in a disadvantageous position, hard by an enemy coast and able to withdraw safely only eastward through a gap in the defensive minefield. But into this gap were thundering both Beatty and Warrender, their forces separated by the shallow southwest patch of the Dogger Bank. Then the weather, previously fine, turned to rain squalls, with poor visibility. Despite this the inimitable Goodenough latched onto the now-retiring Hipper, only to be disengaged by a totally ambiguous signal originating from the *Lion*. Unbelievably, the Germans slipped through. Beatty was heartbroken ('the blackest week of my life') but, rather unfairly, supported censure of Goodenough rather than his own inadequate signal staff.

Only a month later, in January 1915, both Beatty and the outraged British public had a chance for a measure of revenge. Signal traffic warned of another German operation: Hipper, with a light screen, but backed by the might of the High Seas Fleet, was bound for the Dogger Bank area with a vague brief to deal with any British light forces that may have been out.

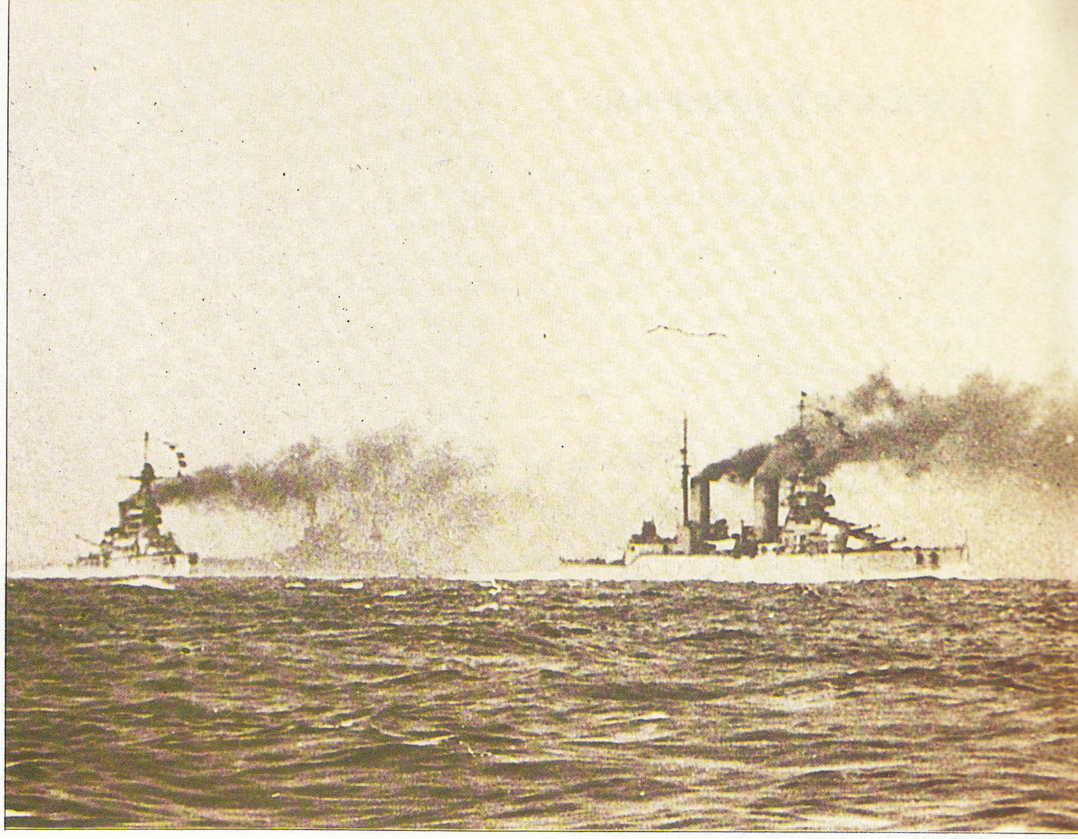


Left: Admiral Sir David Beatty is seen aboard Lion *with his Flag Captain, Captain A.E. Chatfield. Beatty served with distinction during the Boxer Rebellion of 1900, when he was promoted to captain at the exceptionally early age of 29. The youngest admiral since Nelson, he led the British battlecruiser squadron, and later the battlecruiser fleet, with all the elan of a light cavalryman. It was on the bridge of* Lion *that Beatty made a classic understatement: having seen the destruction of* Indefatigable *and* Queen Mary, *he turned to Chatfield to say, 'There seems to be something wrong with our bloody ships today'*

Right: 'Lion' class battlecruisers at sea prior to the battle of Jutland. Princess Royal *and* Lion *were both damaged during the battle, but even then escaped the fate of their sister ship.* Queen Mary *was engaged simultaneously by the German battlecruisers* Seydlitz *and* Derfflinger *when hits forward and in Q magazine led to an explosion that took the ship and the lives of 67 officers and 1,209 men, leaving only a handful of survivors. Note the anti-torpedo nets, which were swung out on booms under the threat of torpedo attack.*



Above: The Lion*'s funnel spacing betrays the manner in which the already generous volume devoted to the 42 boilers and turbine machinery was split by siting the fourth turret amidships. Seen here at Invergordon early in 1915,* Lion *has already landed the boats from the after superstructure. Note the paint scheme.*

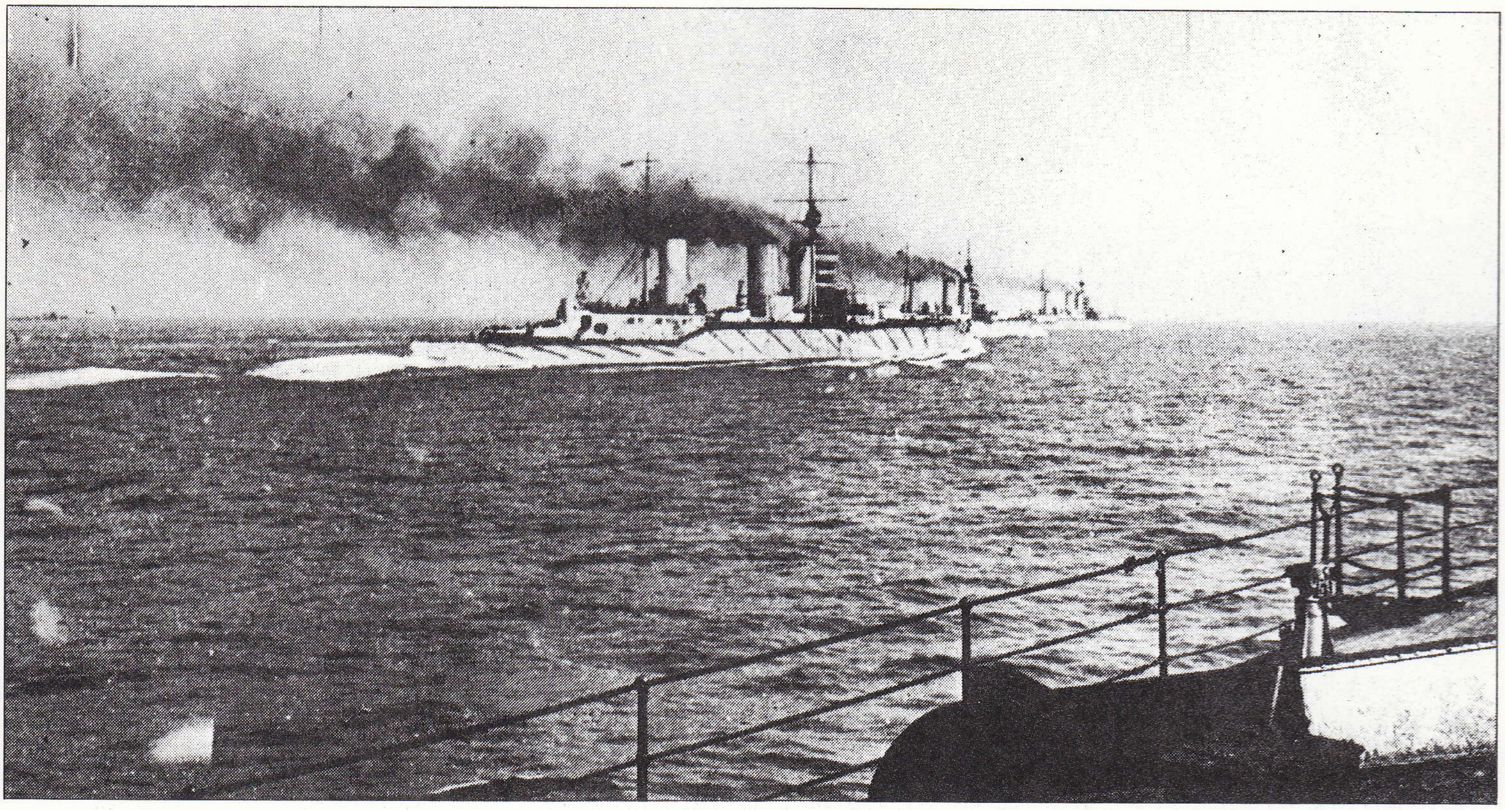


Right: Splendid cats – Lion *and* Tiger *exercise with an 'R'-class battleship in the offing. Losses suffered at Jutland, though fully justified when weighed against results, discredited the battlecruiser concept and, lacking any clear cut postwar role, they were among the first to be taken out of service following the Washington Treaty.*

Beatty sailed with five battle-cruisers and Goodenough's 1st Light Cruiser Squadron, rendezvousing with Tyrwhitt's Harwich Force in the grey of dawn south-east of the bank. Virtually at that instant, the latter ran into Hipper's screen and, as day broke, the *Lion* led the British line in a tail chase of the already fleeing enemy, whose force was slowed somewhat by the hybrid cruiser/battle-cruiser SMS *Blücher*. By full daylight, in clear conditions, the *Lion* had closed to within 18300 m (20,000 yards) of the *Blücher* (at the rear of Hipper's line), and opened fire with her forward 343-mm (13.5-in) guns. As the range dropped to 16000 m (17,500 yards), Beatty signalled each ship to engage its opposite number but, as Hipper had only four ships, this was ambiguous and resulted in SMS *Derfflinger*, ahead of the *Blücher*, not being engaged at all. Undisturbed, she made good practice, and undoubtedly contributed to the severe punishment soon sustained by the *Lion*. Her fuel contaminated by holed tanks and power generators failing, the *Lion* slowed, signalling the remainder to close the enemy. This was followed by an order to turn eight points to avoid a totally nonexistent submarine. Beatty, losing touch as the battle moved away, signalled 'Course NE', followed too quickly by 'Engage the enemy's rear'. The two signals were read in conjunction, and taken to mean that the force should engage the hapless *Blücher* which, shattered and ablaze, was falling well behind the remainder. With no power for signal projectors and at a range where flags could no longer be interpreted, Beatty lost control of the battle. In vain did he shift his flag, for Hipper's three survivors were beyond reach and the *Blücher* fought to the very end.

Lion damaged

Though the enemy had lost a useful ship and SMS *Seydlitz* had narrowly missed blowing up, an annihilating victory had been lost through poor gunnery, poor initiative and poor signalling. As a fuming Fisher wrote, 'What excuse



have we to offer?' The *Lion*, hit by an estimated 16 heavy shells, languished under repair for four months.

On return to service, she was flagship of Beatty's reorganized Battle-Cruiser Fleet of three homogeneous squadrons. A quiet year followed, enlivened only by a couple of seaplane raids on the enemy coast and yet another failure to apprehend a hit-and-run attack, on Lowestoft and Yarmouth in April 1916. Only five weeks later came Jutland.

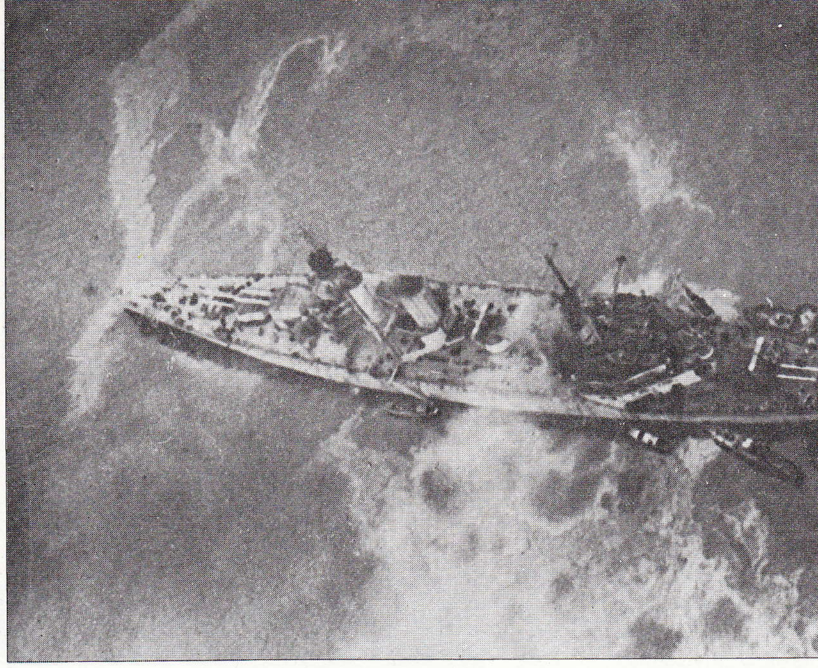
The battle is covered elsewhere but, during the initial 'run to the south', a shell from SMS *Lützow* removed the better part of the roof of 'Q' turret, the resultant explosion and fire in which would have destroyed the ship except for the courageous action of a mortally-wounded Royal Marine officer who promptly flooded the magazine, earning a Victoria Cross. Within 30 minutes Beatty was to see two more of his ships blow up from the same cause, prompting the famous remark to his flag captain that 'there seems to be something wrong with our bloody ships today'.

The *Lion* and her consorts sighted Admiral Scheer's High Seas Fleet, closed it, reported and then drew it to the north onto Jellicoe's guns, finally forcing round the head of the German line to gain time. After the indecisive battle fleet encounter, in the failing light of late dusk, a frustrated Beatty was still in contact with Hipper, unable to goad Jellicoe into further major contact before darkness.

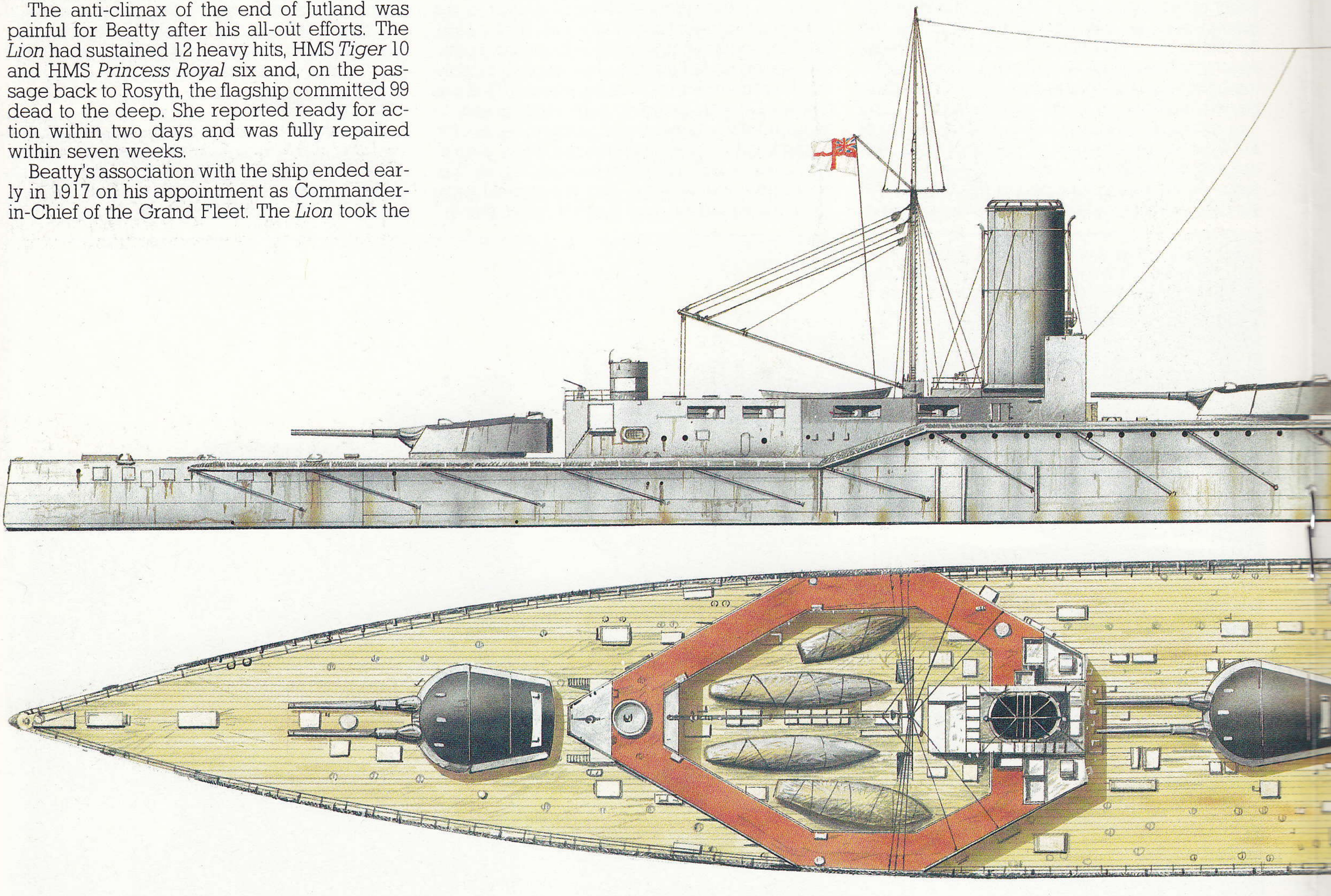
The anti-climax of the end of Jutland was painful for Beatty after his all-out efforts. The *Lion* had sustained 12 heavy hits, HMS *Tiger* 10 and HMS *Princess Royal* six and, on the passage back to Rosyth, the flagship committed 99 dead to the deep. She reported ready for action within two days and was fully repaired within seven weeks.

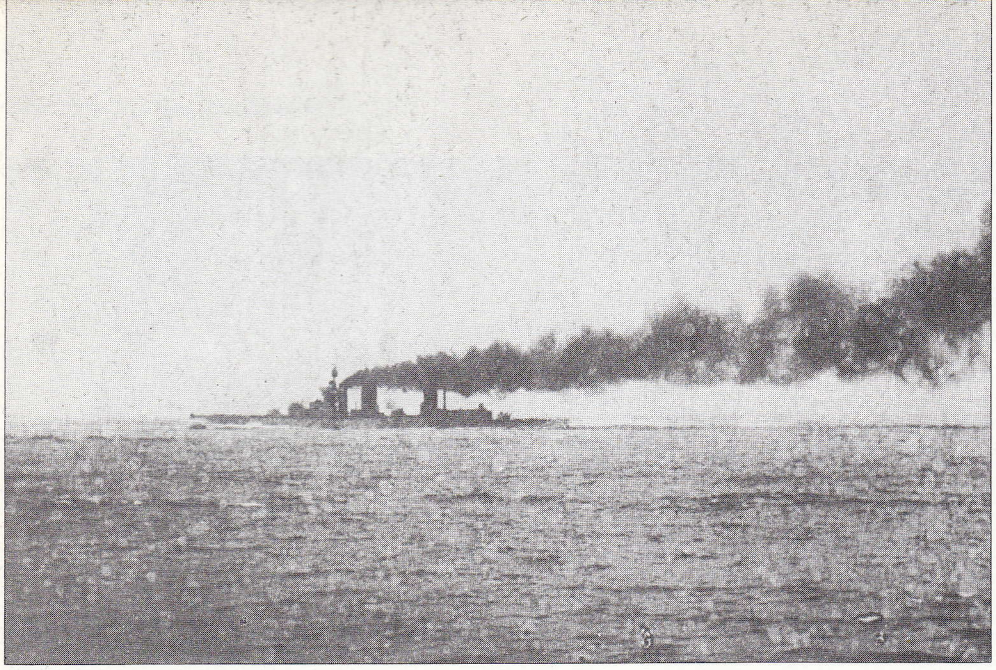
Beatty's association with the ship ended early in 1917 on his appointment as Commander-in-Chief of the Grand Fleet. The *Lion* took the flag of Vice Admiral Pakenham but, although at sea as much as ever, was not again to see action.

A victim of the Washington Treaty conditions, she was scrapped at Jarrow in 1924.

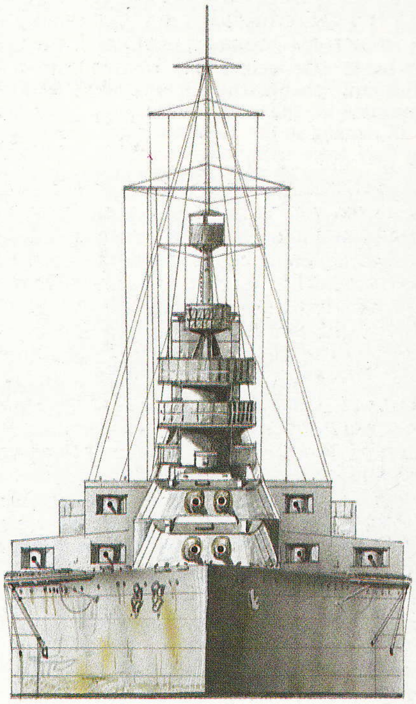


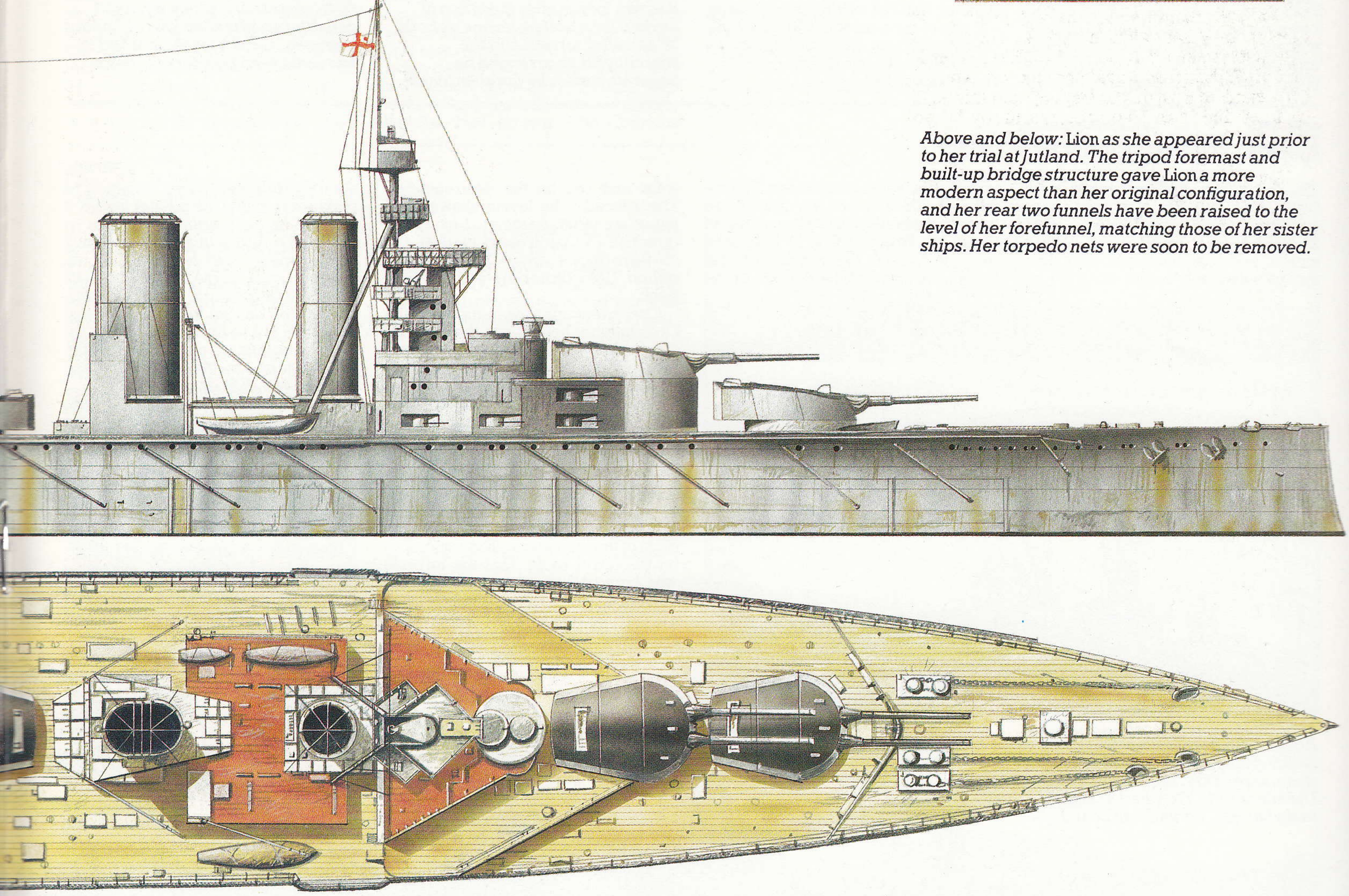
Above: An unusual overhead view of* Lion *shows the dominant effect on the layout due to the single turret amidships. Much useful superstructure area is lost due to the need for angling it to give the maximum firing arcs, and little can be mounted on it because of blast damage. Note that her torpedo nets have been landed.





Above: Jutland. Lion is seen steaming at full speed shortly before receiving the near-disastrous hit on 'Q' turret. Bold handling of the battle cruisers by Beatty meant casualties but ensured success in his primary aims of scouting and reporting, containing Hipper and luring the High Seas Fleet onto Jellicoe's massed guns.





Above and below: Lion as she appeared just prior to her trial at Jutland. The tripod foremast and built-up bridge structure gave Lion a more modern aspect than her original configuration, and her rear two funnels have been raised to the level of her forefunnel, matching those of her sister ships. Her torpedo nets were soon to be removed.

UK

'Renown' class

Orders for the 'Revenge' class battleships were placed in 1914 but then shelved because it was considered that they would not be completed in time for the short war that was anticipated. Following the emphatic success of the battle-cruisers at the Falklands battle of December 1914, however, Admiral Fisher had two units hastily redesigned for delivery in an impossible 15 months as the **'Renown' class**. That they were completed in a little over 18 months as HMS ***Renown*** and HMS ***Repulse*** was a credit to the builders, particularly as extra horizontal protection had to be incorporated at a late stage following the awful experiences of Jutland.

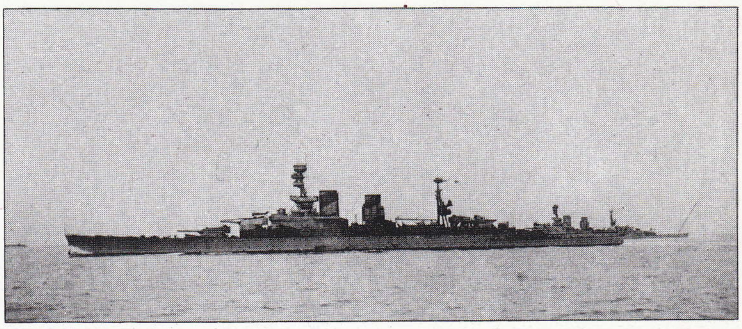
The 'Renowns' were the first two-funnelled British battle-cruisers and the first to mount 381-mm (15-in) guns, though only six of these were shipped due to availability over the very short construction period. At a time when the UK was building the fast and well-protected 'Queen Elizabeth' class 'super-Dreadnoughts', the 'Renowns' represented a step backward, though their 32-kt speed placed them in a class of their own.

Their greatest weakness was in vertical protection and, despite subsequent modernizations, this was not easily rectified since the lower edge of the shallow main belt was supported, just below the load waterline, on the upper slope of the large anti-torpedo bulges which, for the first time, had been made an integral part of the hull structure. Another unsatisfactory feature was the reversion to a 102-mm (4-in) secondary armament, most of which was sited in the new triple mounting that was to fall far short of expectations.

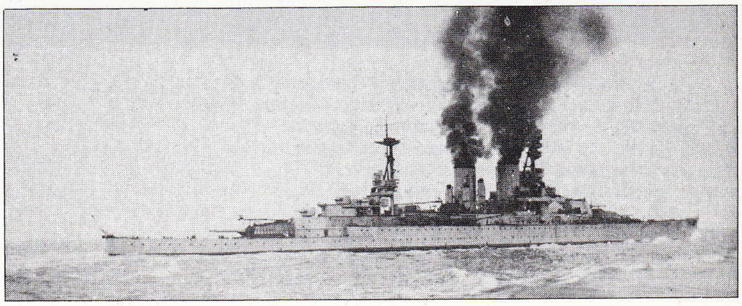
Only the *Repulse* saw any real action during World War I, being involved in the messy and indecisive affair in the German Bight in November 1917. Great efforts were made between the wars to rectify the ships' shortcomings, the *Renown* being particularly thoroughly modernized. With improved protection a new secondary armament and a main battery capable of greater elevation, she both took and delivered punishment, being very active as a unit of Force H. The *Repulse* was less fortunate, being sunk with HMS *Prince of Wales* by an overwhelming Japanese air assault that put five torpedoes into her.

Specification

'Renown' class (as built)
Displacement: 27,950 tons standard and 32,725 tons full load
Dimensions: length 242.01 m (794.0 ft); beam 27.43 m (90.0 ft); draught 8.23 m (27.0 ft)
Propulsion: four sets of geared steam turbines delivering 126,000 shp (93958 kW) to four shafts
Speed: 32 kts
Armament: six 381-mm (15-in), 17 102-mm (4-in) and two 76-mm (3-in) AA guns, and two 533-mm (21-in) torpedo tubes
Armour: belt 152 mm (6 in); bulkheads 102 mm (4 in); barbettes 178 mm (7 in); main deck 76 mm (3 in); deck over steering gear 64 mm (2.5 in)
Complement: 970



This late wartime picture shows* Renown *(foreground) and* Repulse *in a near-identical phase. Noteworthy is the double row of scuttles along the hull, betraying the absence of any vertical armour belt above the waterline. This was rectified soon after the war.* Renown *particularly was to undergo considerable modification.



Renown *is seen after the fitting of aircraft flying-off platforms on both 'B' and after turrets, and the searchlights re-arranged on separate towers by the after funnel.*

Even with oil-firing they were still capable of generating vast quantities of smoke, and the forefunnel had to be raised even before completion.

UK

'Bellerophon' class

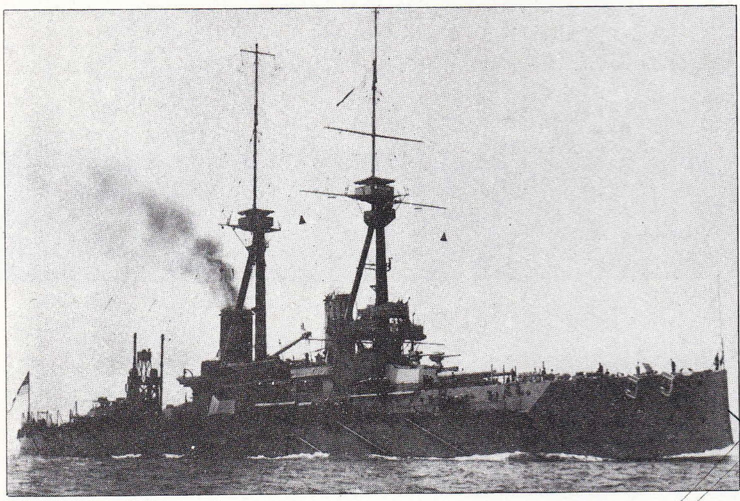
The three 'Billy Ruffians' would have been four but for a slower-than-expected foreign response to HMS *Dreadnought*. Laid down within months of the latter's completion, they incorporated only minor changes on virtually the same dimensions. Ten 45-calibre 305-mm (12-in) guns were arranged similarly in five turrets; of these the foremost was at forecastle deck level and the remainder one deck lower, two of them sided in the waist and two on the centreline aft. Theoretically, the layout allowed between six and eight guns to bear in any direction. All completed in 1909, the 'Bellerophons' were HMS ***Bellerophon***, HMS ***Temeraire*** and HMS ***Superb***.

One great improvement over the *Dreadnought* herself was the substitution of 102-mm (4-in) secondary guns in place of the prototype's near-useless 12-pdr weapons. The 'all-big-gun' doctrine had been taken too literally and the ship was practically helpless against determined torpedo boat attack (a mistake later echoed in the all-missile armaments of the early 1960s). Sixteen larger weapons enabled the 'Bellerophons' to engage such targets at safer ranges, although eight of the guns were sited vulnerably on the turret roofs. That the torpedo was being taken very seriously was evidenced by improved subdivision, notably a 51-mm (2-in) longitudinal bulkhead running the greater length of the ship on each side.

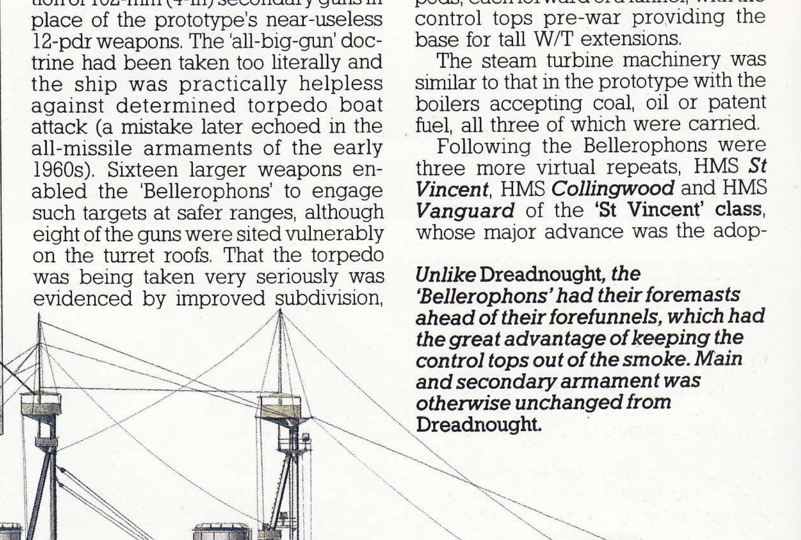
The *Dreadnought*'s masting arrangements had been highly unsatisfactory, a single tripod foremast set abaft the forward funnel and supporting the control top in smoke and heat. The follow-ons had two lofty tripods, each forward of a funnel, with the control tops pre-war providing the base for tall W/T extensions.

The steam turbine machinery was similar to that in the prototype with the boilers accepting coal, oil or patent fuel, all three of which were carried.

Following the Bellerophons were three more virtual repeats, HMS ***St Vincent***, HMS ***Collingwood*** and HMS ***Vanguard*** of the **'St Vincent' class**, whose major advance was the adop-



Above: The 'Billy Ruffian' (i.e.* Bellerophon*) and her two sisters were, essentially, improved Dreadnoughts. They had a similar main battery, similarly disposed.



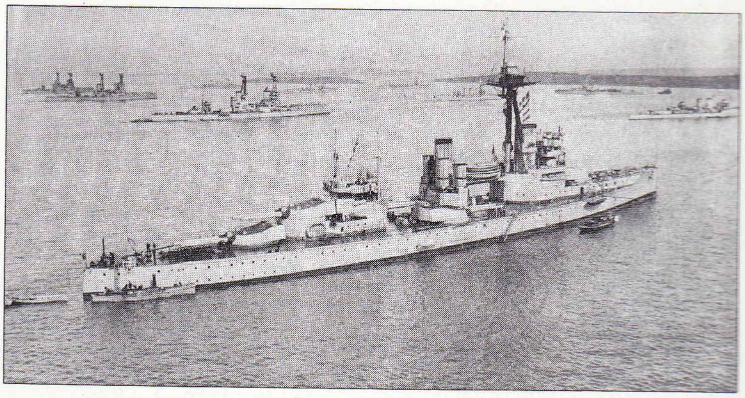
***Unlike* Dreadnought*, the 'Bellerophons' had their foremasts ahead of their forefunnels, which had the great advantage of keeping the control tops out of the smoke. Main and secondary armament was otherwise unchanged from* Dreadnought.**

tion of an improved 50-calibre gun in the main battery. All six ships went through Jutland without a single casualty but the *Vanguard* was destroyed by a magazine explosion in 1917. The remainder fell victim to the terms of the Washington Treaty in the 1920s.

Specification
'Bellerophon' class
Displacement: 18,800 tons standard and 22,100 tons full load
Dimensions: length 160.32 m (526.0 ft); beam 25.15 m (82.5 ft); draught 8.31 m (27.25 ft)
Propulsion: four sets of geared steam turbines delivering 23,000 shp (17151 kW) to four shafts
Speed: 21 kts
Armament: 10 305-mm (12-in), 16 102-mm (4-in) and four 3-pdr guns, and three 457-mm (18-in) torpedo tubes
Armour: belt 254 mm (10 in) amidships; transverse bulkheads 203 mm (8 in); barbettes 228 mm (9 in); upper deck 19 mm (0.75 in); middle deck 76 mm (3 in); lower deck 102 mm (4 in)
Complement: 735

UK

'Colossus' class



Scapa's low hills form the inhospitable backdrop to the* Colossus *and the three 'Bellerophons', all of which were serving in the Fourth Battle Squadron.

Both **'Colossus' class** ships (HMS ***Colossus*** and HMS ***Hercules***, both completed in 1911) were virtual repeats of the single HMS ***Neptune***, laid down some six months before, and showed no significant improvements over her. The *Neptune* herself carried the same main battery as the preceding 'St Vincents' but, in answer to foreign practice, this was laid out so that 10-gun broadsides were possible. To achieve this, the two waist turrets were disposed en echelon, enabling them to fire across the deck, albeit on restricted arcs. Considerable extra stiffening and blast-proofing needed to be incorporated as a consequence. The layout also demanded more length, though this was mitigated somewhat by the adoption, for the first time in the Royal Navy, of superimposed turrets aft.

All 16 102-mm (4-in) guns of the secondary armament were sited behind blast screens within the superstructure blocks. The new layout also severely limited the stowage space for the many boats then carried, so distinctive flying decks were introduced for the purpose. As these were deemed likely to be destroyed in action, thus fouling the amidships guns, one at least was removed in war.

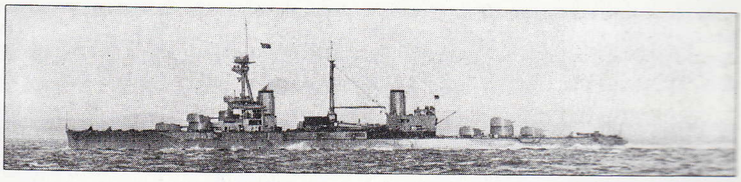
Another effect of the main battery layout was the fragmentation of the ship's internal arrangements. Despite this, the ships were innovatory in being fitted with separate cruising turbines to improve fuel economy at lower speeds.

The superimposition of X-turret decreased the ships' stability range, probably the reason behind the reversion in the two repeat ships to the *Dreadnought*'s layout of a single, lofty tripod. Though often criticized, this arrangement must have proved satisfactory, as it was repeated in further classes. Indeed, the *Neptune*'s after control top was later removed as being almost uninhabitable through smoke and heat. A curious change of thought in the design of the follow-on pair was the abandonment of longitudinal anti-torpedo bulkheads in favour of slightly heavier belt armour. The *Colossus* herself was the only Grand Fleet battleship of the class to suffer heavy-calibre shell damage, but on an insufficient scale to verify the soundness of this new arrangement.

Specification
'Colossus' class
Displacement: 20,220 tons standard and 23,050 tons full load
Dimensions: length 166.42 m (546.0 ft) beam 25.91 m (85.0 ft); draught 7.70 m (25.25 ft)
Propulsion: four sets of geared steam turbines delivering 25,000 shp (18643 kW) to four shafts
Speed: 21 kts
Armament: 10 305-mm (12-in) and 16 102-mm (4-in) guns, and three 533-mm (21-in) torpedo tubes
Armour: belt 279 mm (11 in); transverse bulkheads 254 mm (10 in); barbettes 279 mm (11 in); main deck 38 mm (1.5 in); middle deck 44.5 mm (1.75 in); lower deck 102 mm (4 in)
Complement: 755

UK

'Agincourt' class

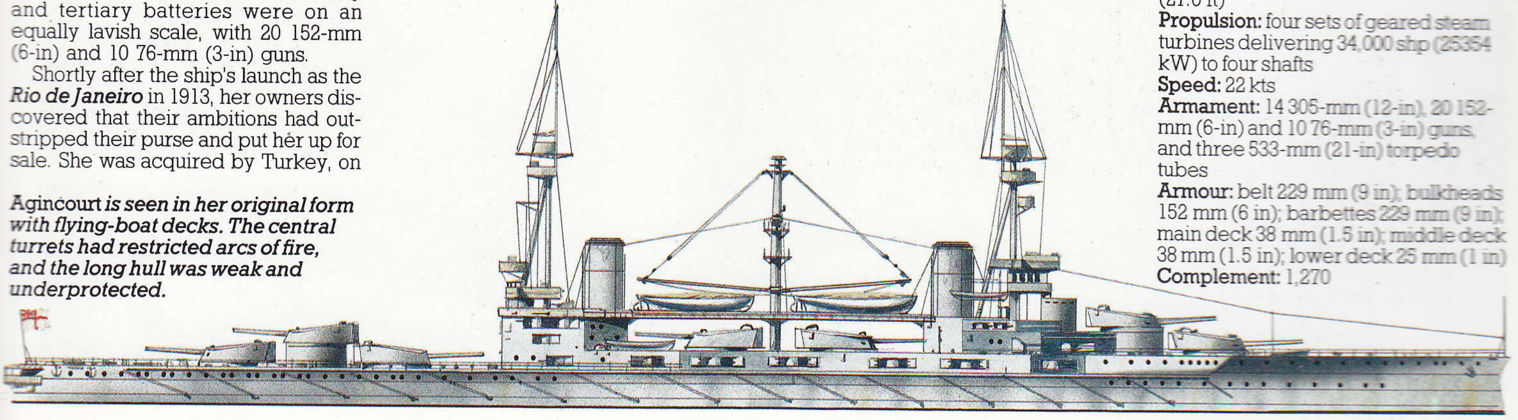


Unique in the Grand Fleet, the* Agincourt *is seen here at gunnery practice. The immense length of hull to accommodate seven centreline turrets is apparent.

HMS ***Agincourt*** was unique. She was ordered from Elswick by Brazil in the course of one of the periodic 'one-upmanship' exercises conducted by the larger South American states to this day. Four impressive designs had been short-listed, that chosen reverting to the 305-mm (12-in) gun (at a time when the British standard was 343-mm/13.5-in) for reasons of commonality with two ships already serving. Even so, no less than 14 barrels were mounted, in seven twin turrets, the most in any battleship. All were sited on the centreline to permit 14-gun broadsides, a spectacle that reportedly was not to be missed. This arrangement demanded a very long hull with, consequently, a reduced standard of protection to cover it. The secondary and tertiary batteries were on an equally lavish scale, with 20 152-mm (6-in) and 10 76-mm (3-in) guns.

Shortly after the ship's launch as the ***Rio de Janeiro*** in 1913, her owners discovered that their ambitions had outstripped their purse and put her up for sale. She was acquired by Turkey, on whose account another battleship was being completed in the UK, and renamed ***Sultan Osman I***. Both, perhaps unfortunately, were completed in the very month of the outbreak of war and, despite being very much 'odd-balls', were appropriated by the Royal Navy as the *Agincourt* and HMS *Erin*. This windfall was, however, acquired at great cost for the irate Turks were placated by a prompt German offer of immediate replacement, which action greatly influenced Turkey's entering the enemy camp. Despite the undoubted firepower of the ship, it was fortunate that she was never severely tested in action for the hull was weak as well as being underprotected, and three of the seven turrets had restricted firing arcs. Offered for sale again to Brazil after the war, she was rejected and prematurely found her way to the breakers in the early 1920s in the company of much other useful tonnage.

Specification
'Agincourt' class
Displacement: 27,500 tons standard and 30,250 tons full load
Dimensions: length 204.67 m (671.5 ft); beam 27.12 m (89.0 ft); draught 8.23 m (27.0 ft)
Propulsion: four sets of geared steam turbines delivering 34,000 shp (25354 kW) to four shafts
Speed: 22 kts
Armament: 14 305-mm (12-in), 20 152-mm (6-in) and 10 76-mm (3-in) guns, and three 533-mm (21-in) torpedo tubes
Armour: belt 229 mm (9 in); bulkheads 152 mm (6 in); barbettes 229 mm (9 in); main deck 38 mm (1.5 in); middle deck 38 mm (1.5 in); lower deck 25 mm (1 in)
Complement: 1,270

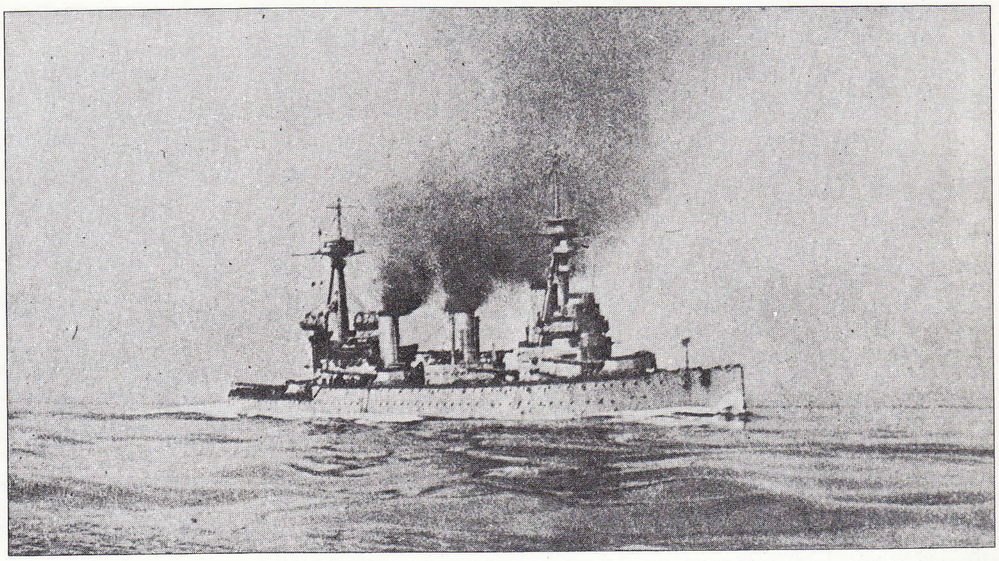


***Agincourt* is seen in her original form with flying-boat decks. The central turrets had restricted arcs of fire, and the long hull was weak and underprotected.**

Jutland

After two years of shadow boxing, the spring of 1916 saw the two greatest fleets in the world at sea and steaming towards each other. If they met, then a battle unlike any previously fought could be expected. The place was Jutland Bank; the date 31 May. Over the following two days some 25 vessels were to be lost, with almost 9,000 sailors dead on both sides.

Indefatigable*, with her sister* New Zealand*, forming the Second Battle Cruiser Squadron at Jutland, is seen at high speed. They could be distinguished from the 'Invincibles' by their equispaced funnels, allowing for improved chances of a full broadside with echeloned amidships turrets. Note the very high boat stowage.*



At 14.20 on 31 May 1916, the British light cruiser HMS *Galatea* made an 'enemy in sight' signal and, with her consorts, went on to engage German light units that had stopped a neutral merchantman. The British ships were attached to Admiral Beatty who, with six battle-cruisers and four 'Queen Elizabeth' class battleships, almost immediately came in to assist. But the German ships also possessed heavy backing in the shape of Admiral Hipper's five battle-cruisers: these too bore in, sighting Beatty at 15.20. It was a fine, if hazy, spring afternoon and the position just west of the Jutland Bank. One of the greatest and most contentious of sea battles was about to commence.

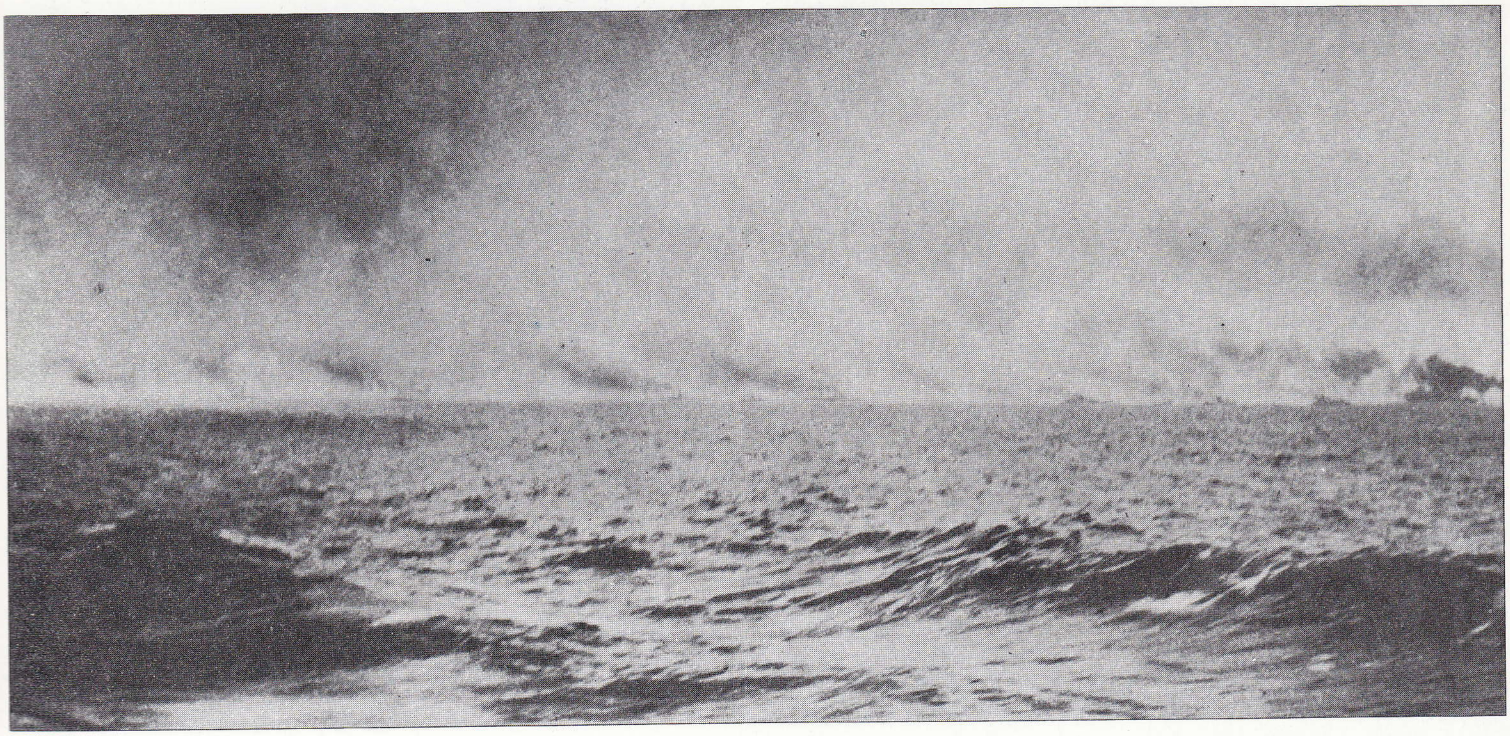
Hipper was in fact out to be seen, his task being to lure out a sizable British squadron, preferably Beatty's, and lead it back into the arms of the main body of the High Seas Fleet for destruction. This body, built around 16 Dreadnoughts and six pre-Dreadnoughts under the overall command of Admiral Scheer, was following some 80 km (50 miles) to the south, and if as expected Beatty steered to cut Hipper off from his bases, he would find himself nicely caught between two fires.

Unfortunately for German plans, much of their routine radio traffic was being monitored and decoded by the British who, with adequate warning of an impending operation, had also sailed the full available strength of the Grand Fleet under Admiral Jellicoe, whose 24 Dreadnoughts were about 113 km (70 miles) to the north of Beatty.

For the moment, as they closed each other, neither battle-cruiser admiral was aware of the presence of these enormous concentrations. It was 15.48 before the opposing forces opened fire, the haze not allowing the British to make use of the superior range of their larger guns. Hipper manoeuvred to keep the ranges short, the tracks parallel and the course southward towards Scheer. His shooting was rapid and accurate and, at 16.02, HMS *Indefatigable* at the tail of the British line was smitten by three simultaneous hits, suffered an explosion and began to settle aft. A minute later she took another salvo forward and disintegrated in a massive magazine explosion.

Within minutes, the slower HMS *Queen Elizabeth* had crept within range, and her forward 381-mm (15-in) guns began to punish the tail of the German line. Beatty impetuously strove to close further and paid the price at 16.26, when the enemy gunners found HMS *Queen Mary*: several hits amidships resulted probably in flash penetrating down to 'Q' turret handling room and magazine, the ship breaking in two in a series of colossal explosions. HMS *Lion*, Beatty's flagship, had narrowly missed a similar fate when hit at 16.00.

Throughout the battle the hazy conditions were accentuated by funnel and gun smoke. This was the scene from the light cruiser* Birmingham *at about 16.00, just before the* Indefatigable *blew up. Beatty's battle cruisers are to the right and the Fifth Battle Squadron, under fire from Hipper, to the left, with light cruisers beyond.



Shortly before the end of the *Queen Mary*, both Beatty and Hipper had ordered destroyer torpedo attacks on the other to relieve the pressure. Under this new threat, Hipper broke off the action temporarily at 16.36 by a turn to the eastward. At this juncture, however, the light cruiser HMS *Southampton*, commanded by the admirable Commodore Goodenough, stationed a little ahead of Beatty, sighted the lead ships of Scheer's main body pounding up from the south. Hipper had done his job perfectly and the stage was now Beatty's. Though surprised by the advancing armada, Beatty did not wait to be annihilated, turning on his heel at 16.46 and taking the shortest course to Jellicoe's position, now some 80 km (50 miles) to the north west. Beatty had now become the lure, the means of delivering the unsuspecting Scheer, now in exuberant full cry, into the grateful hands of the Grand Fleet. To do this successfully, he had both to survive and to ensure that Hipper's marauding battle-cruisers did not sight Jellicoe prematurely.

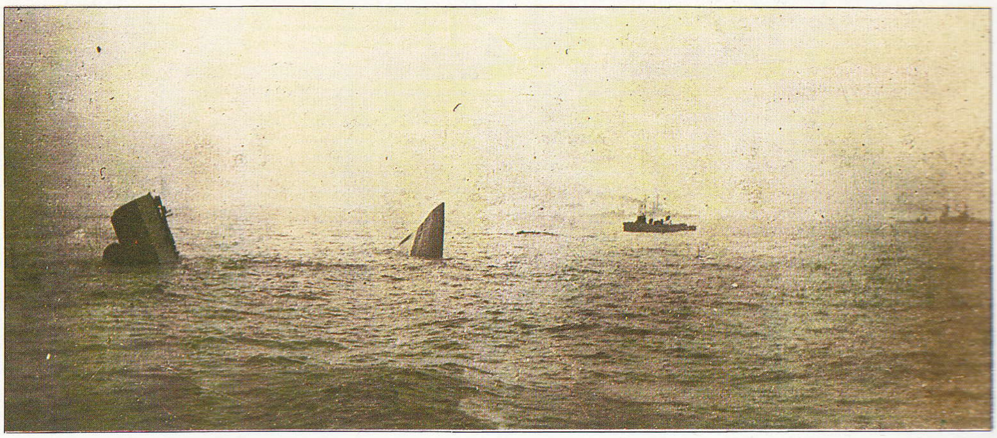
Beatty lures Scheer

Beatty's attached battleships were somewhat tardy in executing their 16-point turn but, falling in astern, covered his rear and, between 16.50 and 17.30, made good practice on the enemy, inflicting 20 hits for only 13 in return. Hipper remained tenaciously in contact with Beatty, the poor visibility which limited their exchanges gradually improving in favour of the latter who, with the lowering sun behind him, succeeded in forcing an enemy disengagement at 17.51. In turning away, however, Hipper faced disaster in running straight into a new opponent in the shape of Rear Admiral Hood's 3rd Battle-cruiser Squadron but succeeded in turning south west and gaining sanctuary at the head of Scheer's force, which was steering about north east. The time was 18.10 and, between them, Beatty and Hood had prevented the sorely-punished Hipper from sighting Jellicoe's van.

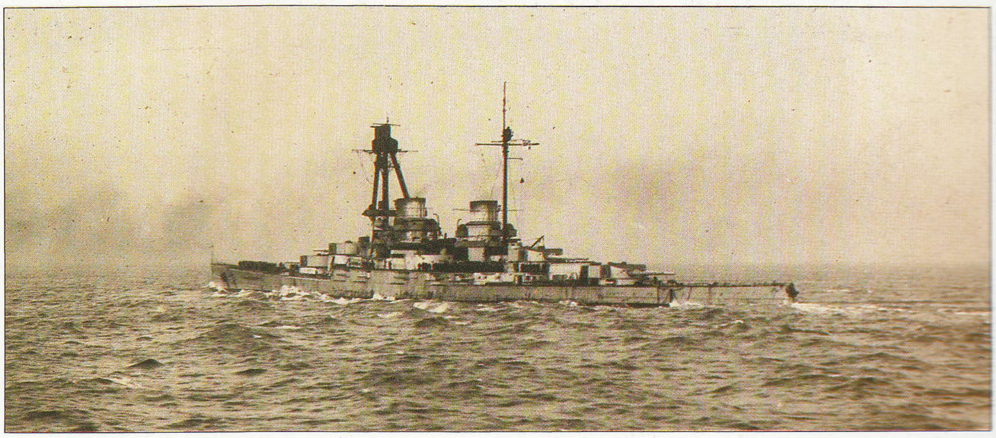
Only about 19 km (12 miles) now separated SMS *König* at the head of the German line from HMS *Marlborough*, the closest of Jellicoe's battleships. These were steaming in six parallel columns (each of four ships) and needed to be deployed into line without delay. This manoeuvre would take at least 15 minutes and had to be correct first time. Jellicoe was undecided on account of a dearth of reliable information on the enemy's bearing, speed and disposition. At this juncture (18.14) Beatty, in the rapidly narrowing gap between the two fleets, made contact, the *Marlborough* sighting his gun flashes. Jellicoe acted swiftly, deploying into line on his port column, steering to the east with the port column leader HMS *King George V* at the head and himself, in the flagship HMS *Iron Duke*, lying ninth in line.

With the *Queen Elizabeth* bringing up the rear, the Grand Fleet presented a solid wall of guns some 9.6 km (6 miles) in length, and not a moment too soon. Even as they manoeuvred into position, the 'Queen Elizabeths' of the 5th Battle Squadron sighted the German line at close range. They attracted heavy fire, at which juncture HMS *Warspite*'s helm jammed, causing the ship to describe two complete circles and to sustain 13 large-calibre hits.

At 18.30 Hood's flagship Invincible *was leading the British line as it forced the head of the High Seas Fleet around to the eastward. At 18.33, under fire from about five enemy ships at short range, she was heavily hit on 'Q' turret amidships. The picture shows the roaring inferno of the magazine fire that preceded the fatal explosion.*

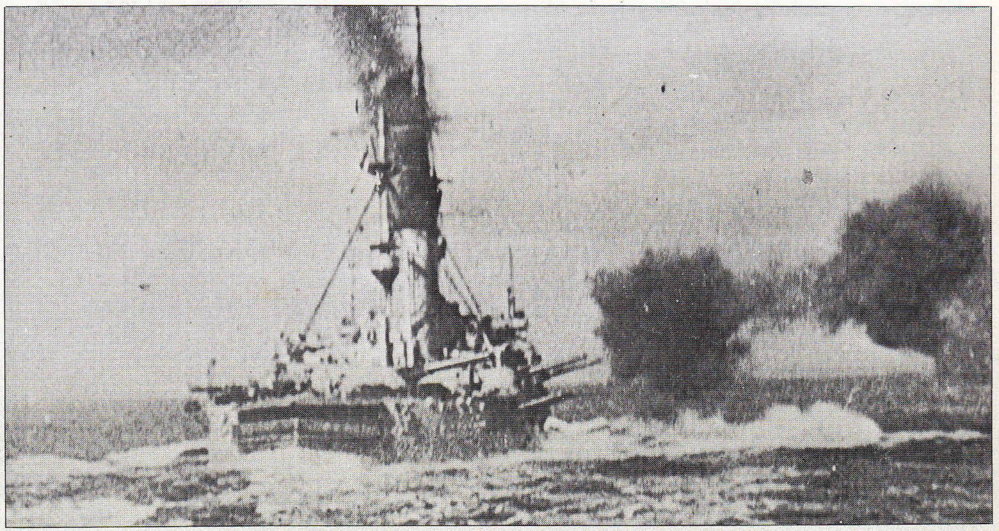


As Jellicoe's fleet turned to starboard by divisions at 18.55 following Scheer's 'battle turnaway', the Benbow *passed this remarkable sight. Her crew cheered, assuming the wreck was German, but it was that of the* Invincible, *destroyed 20 minutes earlier. Only three survivors were rescued by the destroyer* Badger, *also visible.*



Hipper's battlecruisers at Jutland, despite suffering more actual hits, showed a remarkable capacity for survival. The Derfflinger *(seen at a later date) was instrumental in the destruction of both* Invincible *and* Queen Mary, *yet herself survived 21 recorded hits, returning with over 3,000 tons of water in her hull.*

At the head of the British line, Beatty and Hood were again jousting with their opposite numbers when HMS *Invincible* was hit, disintegrating even as had the other two battle-cruisers before her. The British line had, by now, successfully 'crossed the enemy's T' and was pouring an intolerable fire into the head of Scheer's column, which was in a poor position to reply. At 18.33, therefore, Scheer risked all on a simultaneous 16-point turnaway; peacetime practice paid off as, without collision, the German line just melted from the sight of the British gunlayers. Jellicoe's line swung to the south east by divisions and might have missed the Germans, who were moving westward, but for the tenacity of Goodenough's scouting cruisers.



A 'Nassau' class battleship fires a salvo from her amidships guns. Though six turrets were included in the design, only four could bear on either beam. The four 'Nassaus' formed the Second Battleship Division at Jutland but, being elderly, were positioned well back in the line.

Possibly not appreciating his favourable position, Scheer now surprisingly again turned 16 points, running straight at the British who, with the gloom at their backs, made the most of their chance, inflicting about 35 quick hits virtually without reply. Hipper's *Lützow* had had to retire with severe damage, but Scheer sent the remaining four battle-cruisers, already severely damaged themselves, on a suicidal charge at Beatty, synchronized with a destroyer attack. These diversions worked and, as Jellicoe turned away before the threat of the torpedoes, Scheer was able to make a third about-turn.

Little daylight was left and the British had become disengaged, between 19.35 and 20.00, the Grand Fleet very deliberately coming around onto a westerly course. Sunset was at 20.19 and the enemy was in a ragged line heading southward for the Horns Reef channel and home.

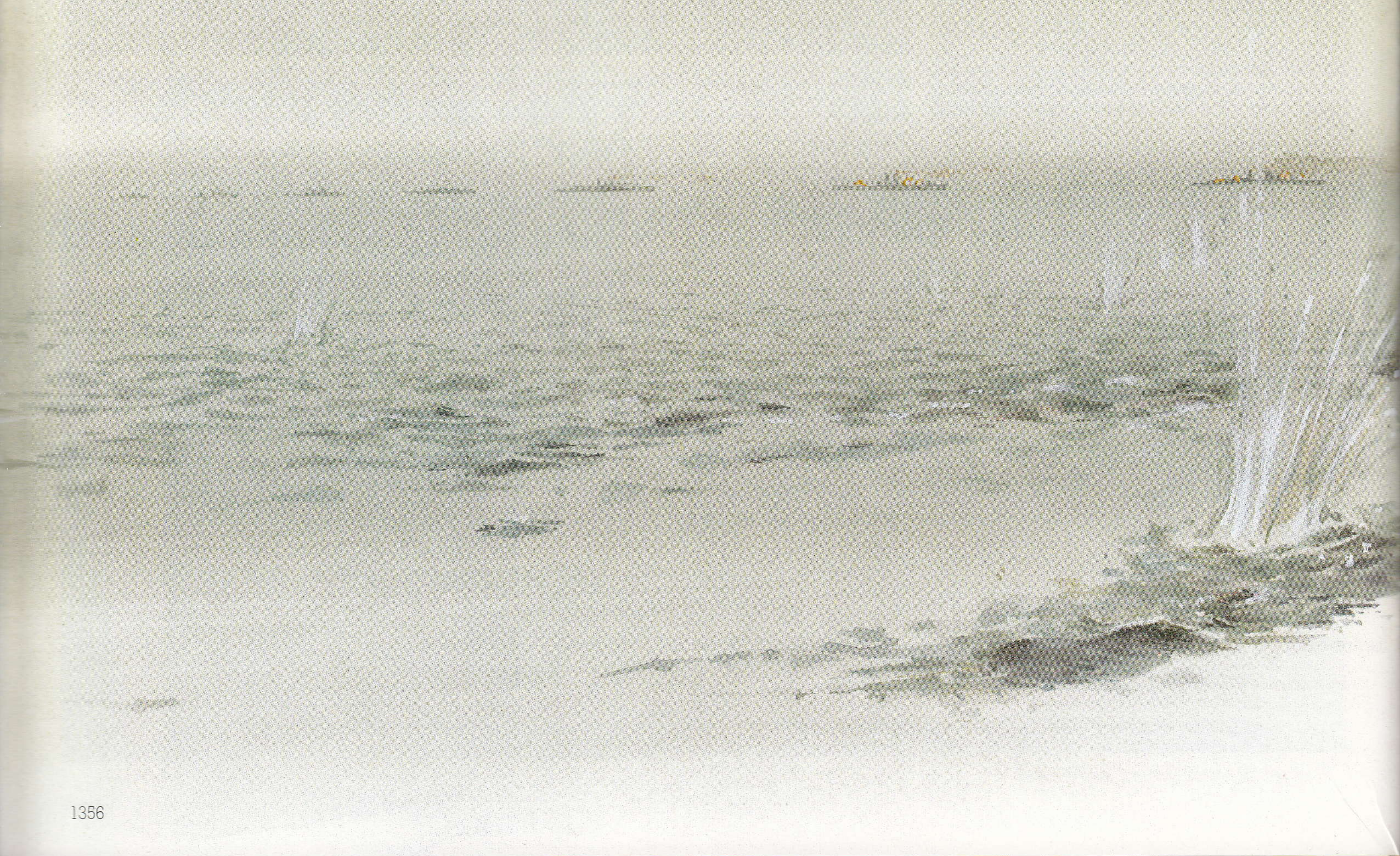
The battle-cruisers were still in contact, and Beatty began to show impatience at Jellicoe's apparent lack of urgency in forcing a decision by cutting off Scheer's line of retreat. Even as Hipper's ships became little but dim silhouettes, Beatty remained, pressing him hard.

Action avoided

Jellicoe did not relish a night action, which would throw away his numerical advantage on a chancy encounter for which the Germans were, in any case, better trained. At 20.45, when a cruiser reported to the British lead ship, *King George V*, that enemy battleships were only 8 km (5 miles) distant, the contact was not prosecuted on the grounds that they were probably Beatty's ships!

The British admiral made his night dispositions in the belief that Scheer could not slip across his bows and would be prevented from crossing astern through his stationing there of massed destroyer flotillas. Action would be resumed at dawn.

Scheer did not oblige, his line passing in stages through Jellicoe's light forces. These fought bravely and at great sacrifice but in vain; without heavy back-up they could not prevent the enemy bursting through. Quite astoundingly, these furious actions were observed by the end of the British line, the battleships neither intervening nor informing Jellicoe of what was occurring.



The battle reached a decisive point at about 18.30. Scheer's High Seas Fleet, engrossed in chasing Beatty's battle cruisers, was confronted by Jellicoe and the Grand Fleet, some 10 km (6 miles) of heavy guns in a line across his bows. The battleship King George V *headed the British line, followed by* Ajax, Centurion, Erin, Orion, Monarch, Conqueror, Thunderer *and the rest of the fleet led by the flagship,* Iron Duke.

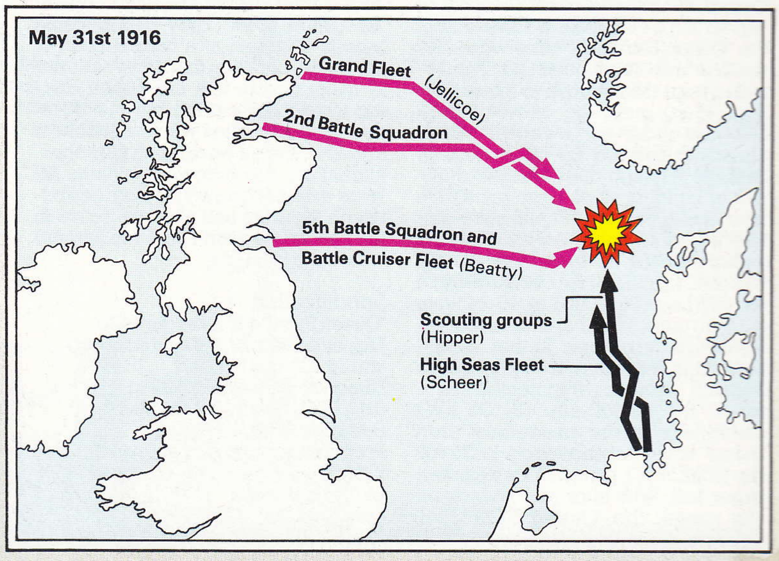
By 01.00 on 1 June Scheer had broken through and, even though still challenged by light forces up to 02.00, no longer had the Grand Fleet athwart his route home. At about 03.00 the *Iron Duke* turned about. Jutland was over.

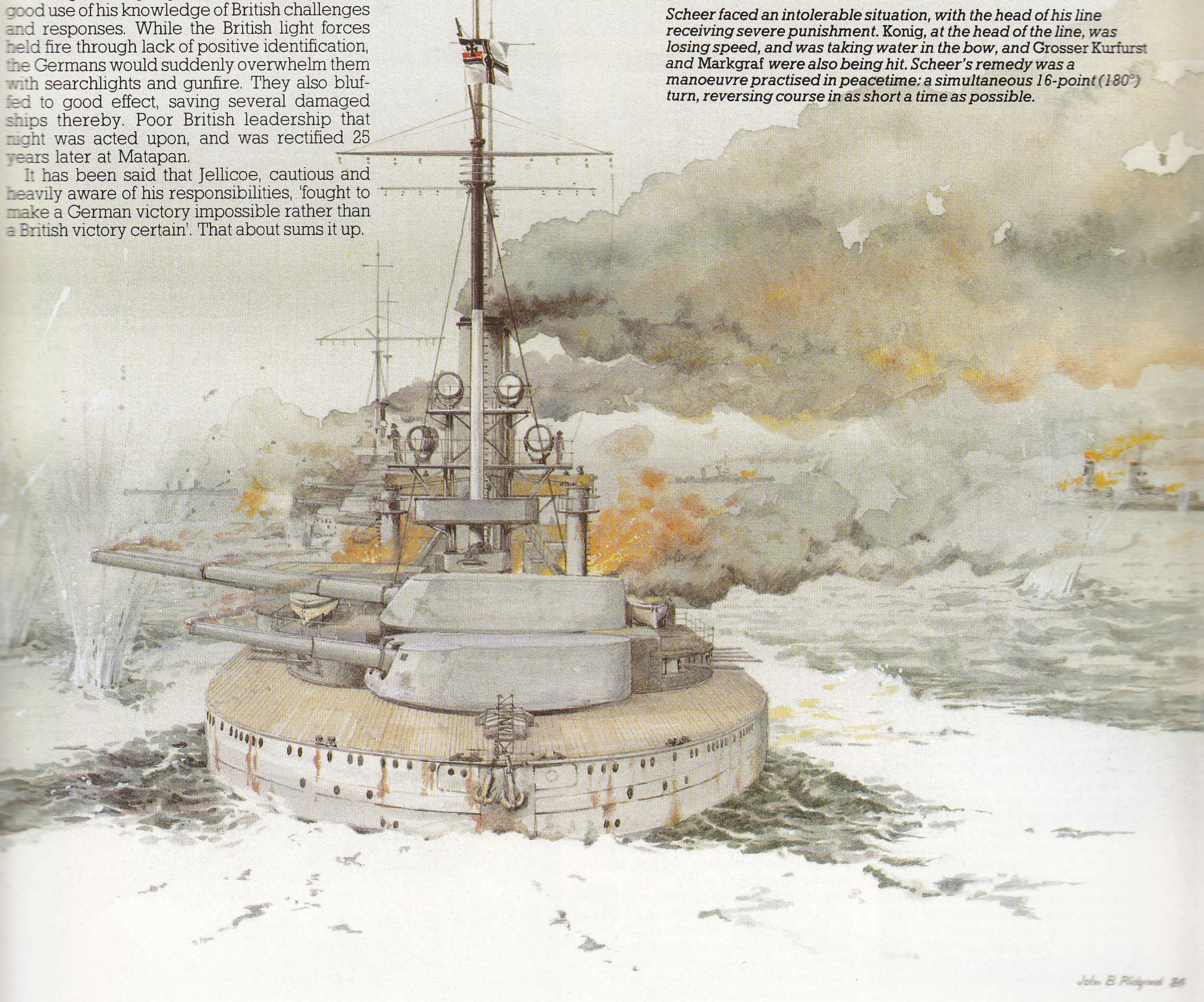
The British had lost three battle-cruisers, three armoured cruisers and eight destroyers to a battleship, a battle-cruiser, four cruisers and five destroyers. Manpower losses were 6,100 British to 2,550 German dead, but the victory that the latter claimed was hollow for, tactically, no beaten fleet ever chased a victor back into port and, strategically, the situation at sea had not changed.

British gunnery had been the better, many more German ships being heavily damaged, but the latter survived because of their better compartmentation, because a greater proportion of their displacement was devoted to protection and because British shells tended to explode on contact rather than on penetration.

During the night phase, the enemy made good use of his knowledge of British challenges and responses. While the British light forces held fire through lack of positive identification, the Germans would suddenly overwhelm them with searchlights and gunfire. They also bluffed to good effect, saving several damaged ships thereby. Poor British leadership that night was acted upon, and was rectified 25 years later at Matapan.

It has been said that Jellicoe, cautious and heavily aware of his responsibilities, 'fought to make a German victory impossible rather than a British victory certain'. That about sums it up.





Scheer faced an intolerable situation, with the head of his line receiving severe punishment. Konig, *at the head of the line, was losing speed, and was taking water in the bow, and* Grosser Kurfurst *and* Markgraf *were also being hit. Scheer's remedy was a manoeuvre practised in peacetime: a simultaneous 16-point (180°) turn, reversing course in as short a time as possible.*

UK

'Queen Elizabeth' class

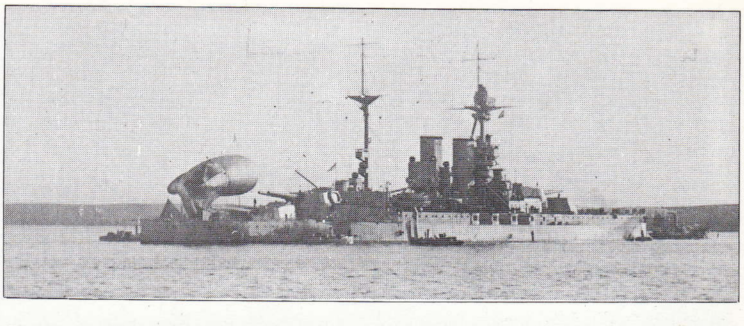
One of the most successful classes of capital ships ever built, the five units of the **'Queen Elizabeth' class** were also the first true fast battleships. This resulted from the decision to mount 381-mm (15-in) guns, the current British 343-mm (13.5-in) weapon being already surpassed by larger foreign calibres. Though there was no question of building ships large enough to take the accepted 10-gun main battery, an eight-gun battery was deemed acceptable as its broadside weight was 6940 kg (15,300 lb) compared with the 6350 kg (14,000 lb) of 10 343-mm (13.5-in) guns. The abandonment of the amidships turret was further advantageous in that the machinery spaces beneath were not fragmented. As a result the 29,000-shp (21625-kW) machinery of the preceding 'Iron Dukes' could be increased to 75,000 shp (55927 kW), giving 24 kts despite a larger hull. With improved speed and gun range, the 'Queen Elizabeths' were judged able to accept protection on a slightly reduced scale and their greatly increased bunker requirements were met by the adoption of all-oil firing. One drawback was that much bunker space lay between the outer skin and the longitudinal 'torpedo bulkheads'. As oil is incompressible this space could no longer satisfactorily absorb an explosion; moreover, if essentially empty it could well be filled with an explosive vapour. The three 1915 units were HMS ***Queen Elizabeth***, HMS ***Warspite*** and HMS ***Barham***, while the two 1916 units were HMS ***Valiant*** and HMS ***Malaya***.

The powerful 16 152-mm (6-in) secondary battery was feasible only by siting the majority in casemates, a layout already so completely discredited as to guarantee that only the nameship was thus completed.

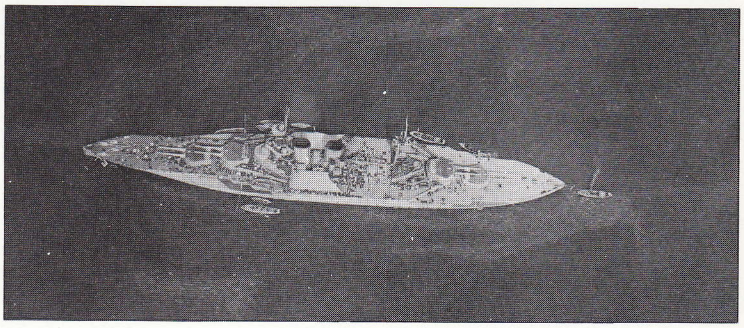
Four of the class were present at Jutland as the homogeneous 5th Battle Squadron which, because of its speed, was attached to Beatty's battle-cruiser force rather than to the main body of the Grand Fleet. They thus became heavily engaged at a critical point of the battle. Between them they suffered 27 major calibre hits, the *Valiant* coming through unscathed but the *Warspite* taking 13. They were well able to absorb it and all were again fully operational by the following month. All were modified in varying degrees between the wars and all were active in the second, in which only the *Barham* became a total loss.

Specification

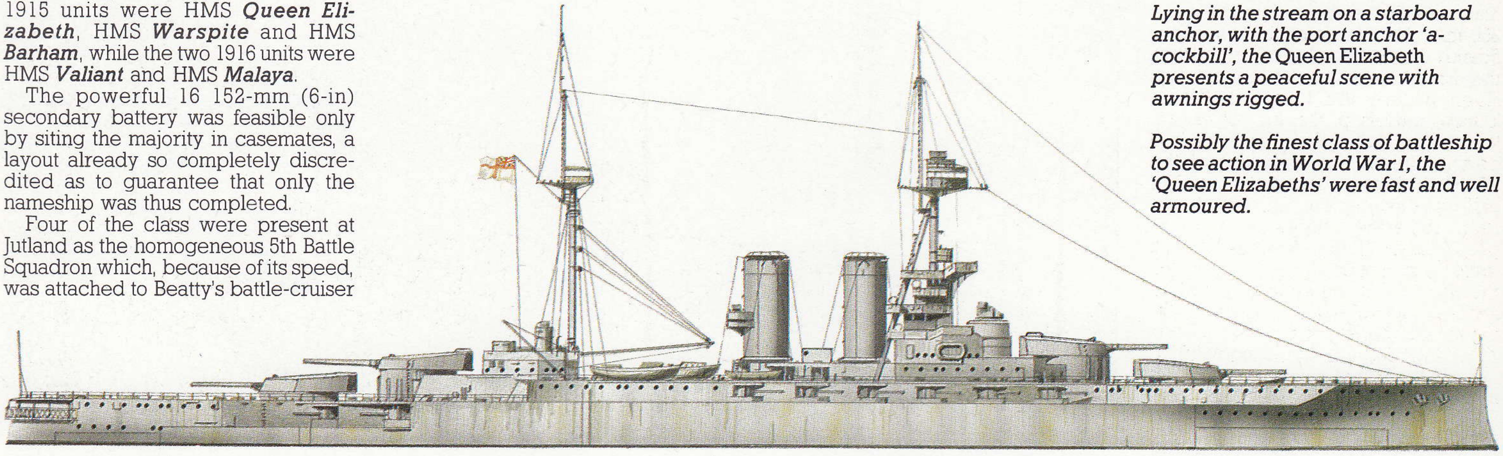
'Queen Elizabeth' class (as built)
Displacement: 29,150 tons standard and 33,000 tons full load
Dimensions: length 196.82 m (645.75 ft); beam 27.58 m (90.5 ft); draught 9.35 m (30.66 ft)
Propulsion: four sets of geared steam turbines delivering 75,000 shp (55927 kW) to four shafts
Speed: 24 kts
Armament: eight 381-mm (15-in), 14 152-mm (6-in) and two 76-mm (3-in) AA guns, and four 533-mm (21-in) torpedo tubes
Armour: belt 330 mm (13 in); bulkheads 152-mm (6-in); barbettes 254 mm (10 in); upper deck 44 mm (1.75 in); main deck 32 mm (1.25 in); middle deck 25 mm (1 in); lower deck 76 mm (3 in)
Complement: 950



The* Queen Elizabeth *toward the end of the war, recognizable by her masts of virtually equal height. Soon after this, aircraft flying-off platforms were added to each of the superimposed turrets. The lighting puts the casemate guns into high relief, only the forward ones being fitted. The spotting balloon lies beyond.



Lying in the stream on a starboard anchor, with the port anchor 'a-cockbill', the* Queen Elizabeth *presents a peaceful scene with awnings rigged.



Possibly the finest class of battleship to see action in World War I, the 'Queen Elizabeths' were fast and well armoured.

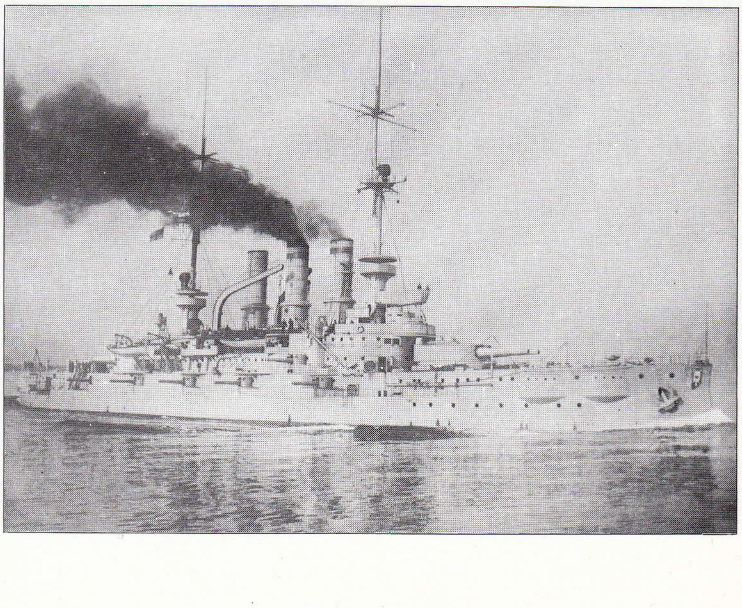
GERMANY

'Deutschland' class

Last of the German pre-Dreadnoughts, the five **'Deutschland' class** ships continued the progression of small battleships dimensioned for the North Sea and Baltic use rather than worldwide deployment. Together with the very similar 'Braunschweigs' that preceded them, they marked a major step forward in the adoption of the 280-mm (11-in) gun in place of earlier classes' 240-mm (9.4-in) weapon. Following contemporary practice, the main battery of four guns was disposed in twin barbette mountings forward and aft. A heavy secondary battery of 14 170-mm (6.7-in) weapons was flawed by being sited in low casemates. Six torpedo tubes were carried (two on each beam, one above the forefoot and one offset beneath the counter). The ships, all completed between 1904 and 1906, were SMS ***Deutschland***, SMS ***Hannover***, SMS ***Pommern***, SMS ***Schlesien*** and SMS ***Schleswig-Holstein***.

Well armoured for their size, the ships had a protective lower deck that ran full length. At main deck level a strip of light horizontal armour ran the length of each side of the central redoubt, protecting the casemates. No torpedo bulkheads were fitted, the inadequacy of the wing coal bunker spaces for protection being demonstrated when the *Pommern* was torpedoed by a British destroyer in the closing stages of Jutland. The resulting magazine explosion destroyed both the ship and her 839 crew.

A funnel originally served each of



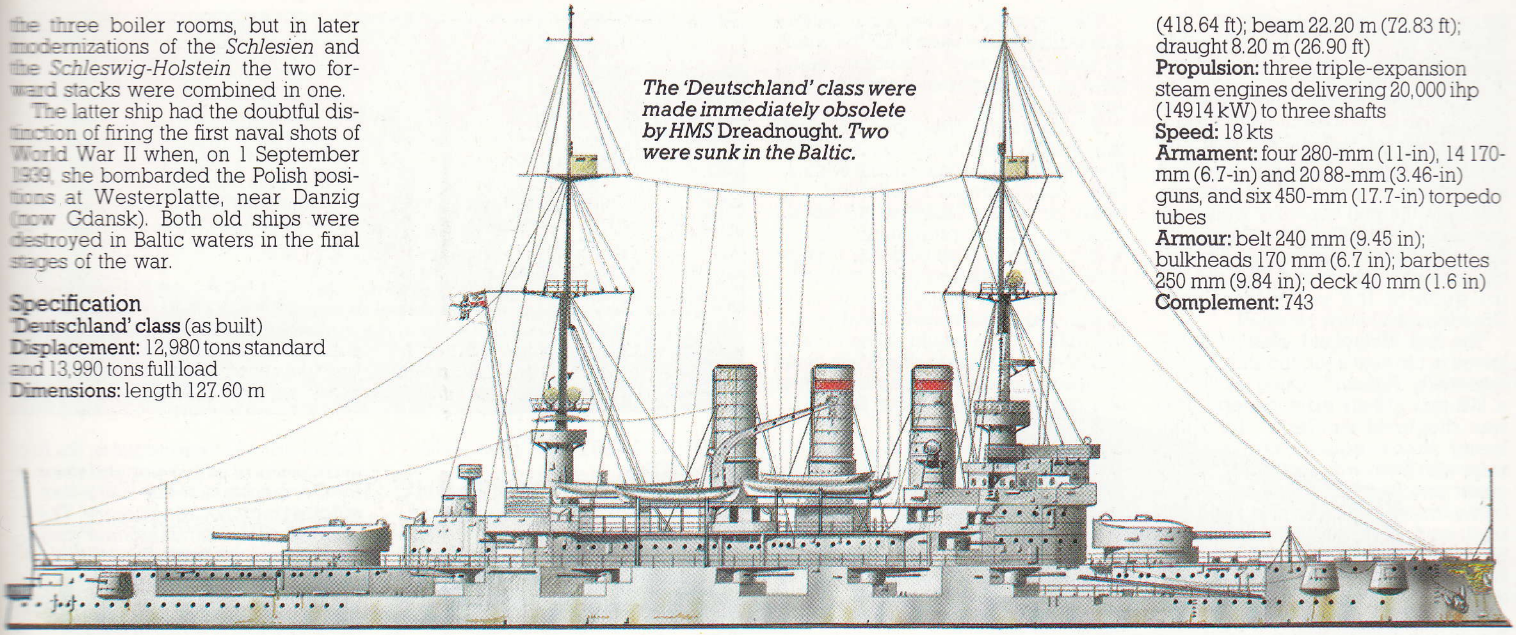
Ploughing through a peaceful prewar sea, the* Schleswig-Holstein *was the very last German pre-Dreadnought. Only one 280-mm (11-in) turret is sited at each end, and all seven casemated 170-mm (6.7-in) guns are seen trained on the beam. The 'blisters' of the original bowchasers have been plated over to give extra accommodation space.

the three boiler rooms, but in later modernizations of the *Schlesien* and the *Schleswig-Holstein* the two forward stacks were combined in one.

The latter ship had the doubtful distinction of firing the first naval shots of World War II when, on 1 September 1939, she bombarded the Polish positions at Westerplatte, near Danzig (now Gdansk). Both old ships were destroyed in Baltic waters in the final stages of the war.

Specification

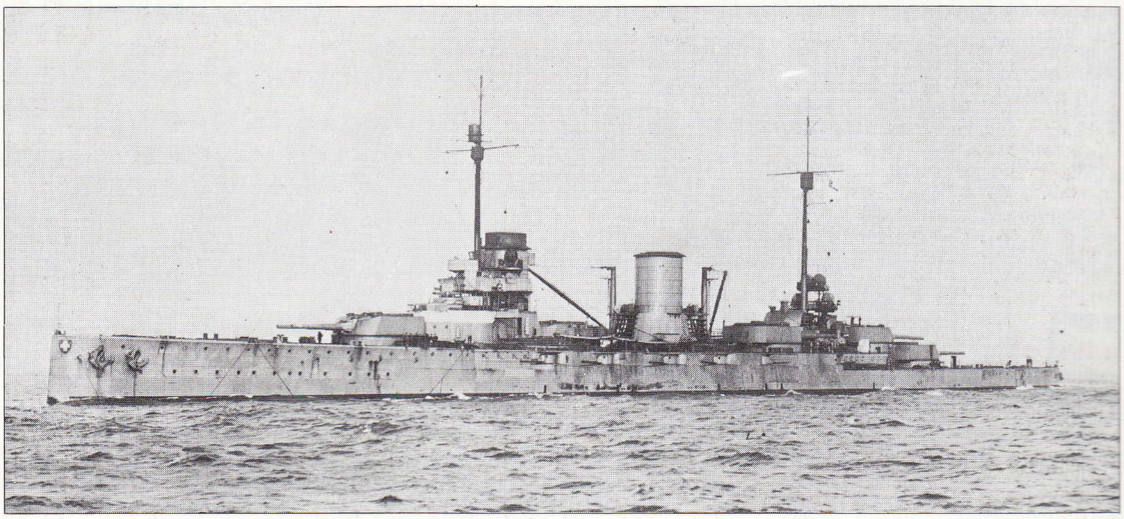
'Deutschland' class (as built)
Displacement: 12,980 tons standard and 13,990 tons full load
Dimensions: length 127.60 m (418.64 ft); beam 22.20 m (72.83 ft); draught 8.20 m (26.90 ft)
Propulsion: three triple-expansion steam engines delivering 20,000 ihp (14914 kW) to three shafts
Speed: 18 kts
Armament: four 280-mm (11-in), 14 170-mm (6.7-in) and 20 88-mm (3.46-in) guns, and six 450-mm (17.7-in) torpedo tubes
Armour: belt 240 mm (9.45 in); bulkheads 170 mm (6.7 in); barbettes 250 mm (9.84 in); deck 40 mm (1.6 in)
Complement: 743



The 'Deutschland' class were made immediately obsolete by HMS Dreadnought*. Two were sunk in the Baltic.*

GERMANY

'Moltke' class



Looking distinctly weather-worn, the Moltke *was sister to the* Goeben *and near-sister of* Seydlitz*. Later German battlecruisers had a more compact look, dropping the echeloned amidships turrets in favour of fewer but larger guns, sited in superimposed turrets at either end.*

Though Germany's first battle-cruiser SMS *Von der Tann* carried an eight-gun main battery disposed similarly to that in her British contemporaries, the 280-mm (11-in) calibre threw a significantly lower broadside weight than the British 305-mm (12-in) battery. Even before the *Von der Tann*'s launch, therefore, the first of an enlarged pair of follow-ons was laid down. These two examples of the **'Moltke' class** retained the smaller calibre, though in an improved version, but added an extra, superimposed turret aft. The forecastle deck level was continued aft to this point, raising both of the amidships turrets and the casemated secondary armament. SMS ***Moltke*** was completed in 1911, SMS ***Goeben*** following in 1912.

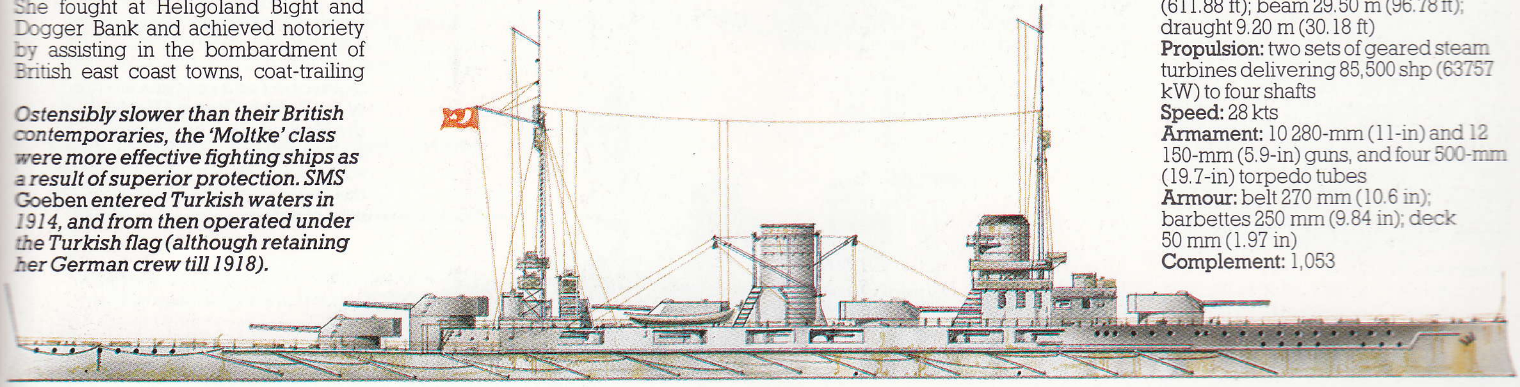
Turbine-propelled, their legend speed was inferior to that of their British equivalents though, in practice, they could well hold their own. Better protected than even the later British 'Lion' class, they were shorter but beamier, well subdivided and stable.

The *Moltke* served with Admiral Hipper's battle-cruiser squadron throughout the war, twice surviving torpedoing by British submarines. She was the least damaged of Hipper's ships at Jutland, though receiving four heavy-calibre hits (one 305-mm/12-in piercing her main belt at long range) and taking aboard 1,000 tons of water. She fought at Heligoland Bight and Dogger Bank and achieved notoriety by assisting in the bombardment of British east coast towns, coat-trailing exercises designed to entice out elements of the British fleet into prepared ambush.

The *Goeben* became something of a *cause célèbre* when, at the very outset, she evaded the British Mediterranean Fleet to reach Turkey as a replacement for the latter's appropriated battleships (see the *Agincourt* entry). Under Turkish colours, but German-crewed, she spent the war largely 'in-being', threatening the Black Sea and Levant. In action several times, she survived mining, grounding and bombing. Days before hostilities ended, she was finally handed over, to serve as the Turkish ***Yavuz*** to as late as 1963.

Specification

'Moltke' class (as built)
Displacement: 22,610 tons standard and 25,000 tons full load
Dimensions: length 186.50 m (611.88 ft); beam 29.50 m (96.78 ft); draught 9.20 m (30.18 ft)
Propulsion: two sets of geared steam turbines delivering 85,500 shp (63757 kW) to four shafts
Speed: 28 kts
Armament: 10 280-mm (11-in) and 12 150-mm (5.9-in) guns, and four 500-mm (19.7-in) torpedo tubes
Armour: belt 270 mm (10.6 in); barbettes 250 mm (9.84 in); deck 50 mm (1.97 in)
Complement: 1,053



Ostensibly slower than their British contemporaries, the 'Moltke' class were more effective fighting ships as a result of superior protection. SMS Goeben *entered Turkish waters in 1914, and from then operated under the Turkish flag (although retaining her German crew till 1918).*

GERMANY

'Helgoland' class

Germany's first Dreadnoughts, the four 'Nassaus' of 1907, were remarkable mainly for their conservatism. Limited in length and draught, they were made exceptionally beamy. With the requirement for an eight-gun broadside, yet lacking the length for sufficient centreline turrets, the designers opted for six twin turrets, set in a hexagon. Although the hull was very well compartmented, it was badly broken up by the main battery disposition. The reciprocating engines and 280-mm (11-in) guns of the preceding pre-Dreadnoughts were retained.

The four **'Helgoland' class** units followed in the next year, the ships being essentially 'Nassaus' scaled up to take a 305-mm (12-in) main battery. This was disposed similarly, the ships being almost equally portly. They were also fitted with reciprocating engines, despite the fact that the pioneer battle-cruiser SMS *Von der Tann* had been equipped with steam turbines in the previous year. The machinery had been upgraded, however, from triple to quadruple expansion and, when pushed, the three engines could drive the ships at 21 kts, as fast as their British contemporaries. An odd reversion was to three funnels, particularly surprising as the three boiler rooms were adjacent, whereas in the two-funnelled 'Nassaus' these spaces were divided two-and-one. The first three units were SMS ***Thüringen***, SMS ***Helgoland*** and SMS ***Ostfriesland***, all completed in 1911, joined in 1912 by SMS ***Oldenburg***.

The topweight of the main battery was probably the reason for the whole 14-gun secondary armament being sited in the casemates too low to be of any practical use.

At Jutland, the *Thüringen* shattered the British armoured cruiser HMS *Black Prince* in a chance night encounter. The *Helgoland* received one heavy hit and the *Ostfriesland* struck a mine during the retirement. All four were disposed of as post-war reparations, the *Ostfriesland* going to the United States and being sunk in celebrated but controversial aerial bombing trials. These would seem to have indicated that topside direct hits could be absorbed but the concussive effect of a near miss could prove fatal.

Specification

'Helgoland' class

Displacement: 22,440 tons standard and 24,310 tons full load

Dimensions: length 167.20 m (548.55 ft); beam 28.50 m (93.5 ft); draught 8.90 m (29.2 ft)

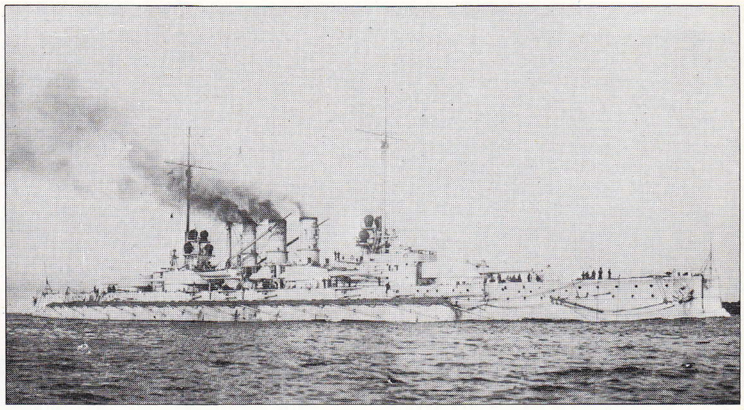
Propulsion: three quadruple-expansion steam engines delivering 28,000 ihp (20880 kW) to three shafts

Speed: 20 kts

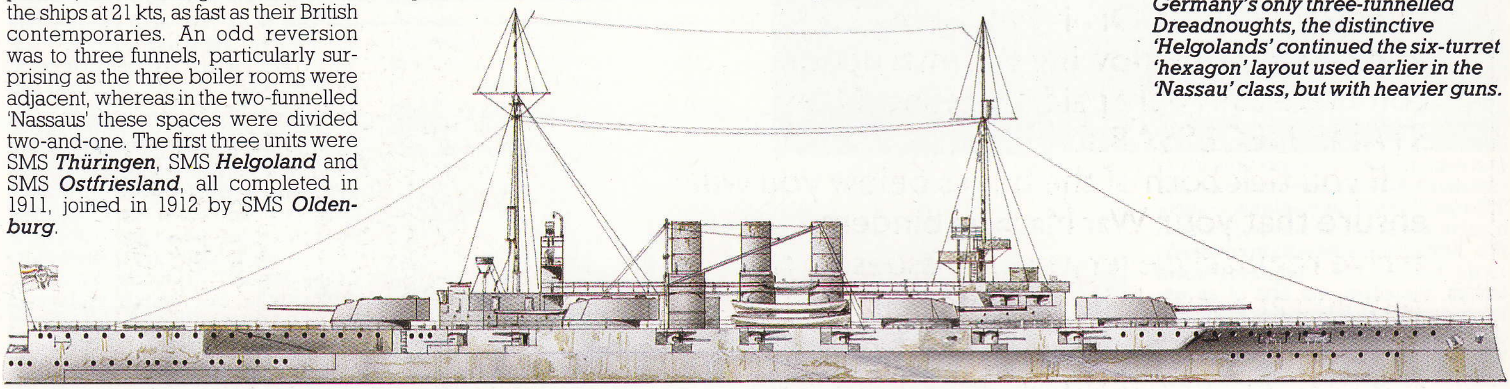
Armament: 12 305-mm (12-in) and 14 150-mm (5.9-in) guns, and six 500-mm (19.7-in) torpedo tubes

Armour: belt 300 mm (11.8 in); bulkheads 300 mm (11.8 in); barbettes 270 mm (10.6 in); deck 55 mm (2.17 in)

Complement: 1,110



Unlike British Dreadnoughts, the first two classes of all big-gunned ships in the German navy retained the less efficient reciprocating engine. The four vessels in the 'Helgoland' class saw action with Battle Squadron I at Jutland, where* Helgoland *and* Ostfriesland *received some damage.



Germany's only three-funnelled Dreadnoughts, the distinctive 'Helgolands' continued the six-turret 'hexagon' layout used earlier in the 'Nassau' class, but with heavier guns.

GERMANY

'Baden' class

Rumours that caused the British to opt for 381-mm (15-in) guns in the 'Revenge' and 'Queen Elizabeth' classes were true, their contemporaries, the **'Baden' class**, receiving the marginally smaller 380-mm weapon. As the Germans had considered their existing 305-mm (12-in) gun to be only slightly inferior to the British 343-mm (13.5-in) gun, they did not develop an equivalent intermediate calibre, so the eventual step was the greater and the results initially disappointing in SMS ***Baden*** and SMS ***Bayern***, each completed in 1916.

The preceding 'Kaiser' and 'König' classes had each shipped a 10-gun main battery, the former with superimposed after turrets and two echeloned mounts amidships, and the latter much improved with superimposition at each end and a single centreline turret in the waist. Like their British counterparts, the designers of the 'Baden' class found that four of the larger twin mountings was the best that could be practically accommodated, the similar arrangement of two superimposed turrets, forward and aft, also requiring a shorter protected citadel. Though very thoroughly subdivided by virtue of longitudinal bulkheads and coal bunkers stretching continuously from 'A' to 'Y' turrets, the degree of protection in the 'Badens' was afterwards reckoned to be inferior to that of the British 'Revenges'. Coal firing was inferior on several counts (e.g. awkward bunkering and refuelling and large quantities of smoke produced at speed) but necessary because Germany could not guarantee her oil supplies in time of war.

Of the planned class of four, only the *Baden* and *Bayern* were ever completed and neither of these saw much useful action. Both of the others (*Sachsen* and *Württemberg)* could have been finished well before the Armistice, but again like the British, the Germans needed to put their priorities elsewhere in the prosecution of a 'short' war. In 1919 both ships were scuttled by their crews at Scapa, the *Bayern* successfully and the *Baden* being beached by the Royal Navy. Taken south to Portsmouth, she was thoroughly evaluated before being sunk in the English Channel as a gunnery target.

Specification

'Baden' class

Displacement: 28,060 tons standard and 31,700 tons full load

Dimensions: length 180.00 m (590.55 ft); beam 30.00 m (98.43 ft); draught 9.40 m (30.84 ft)

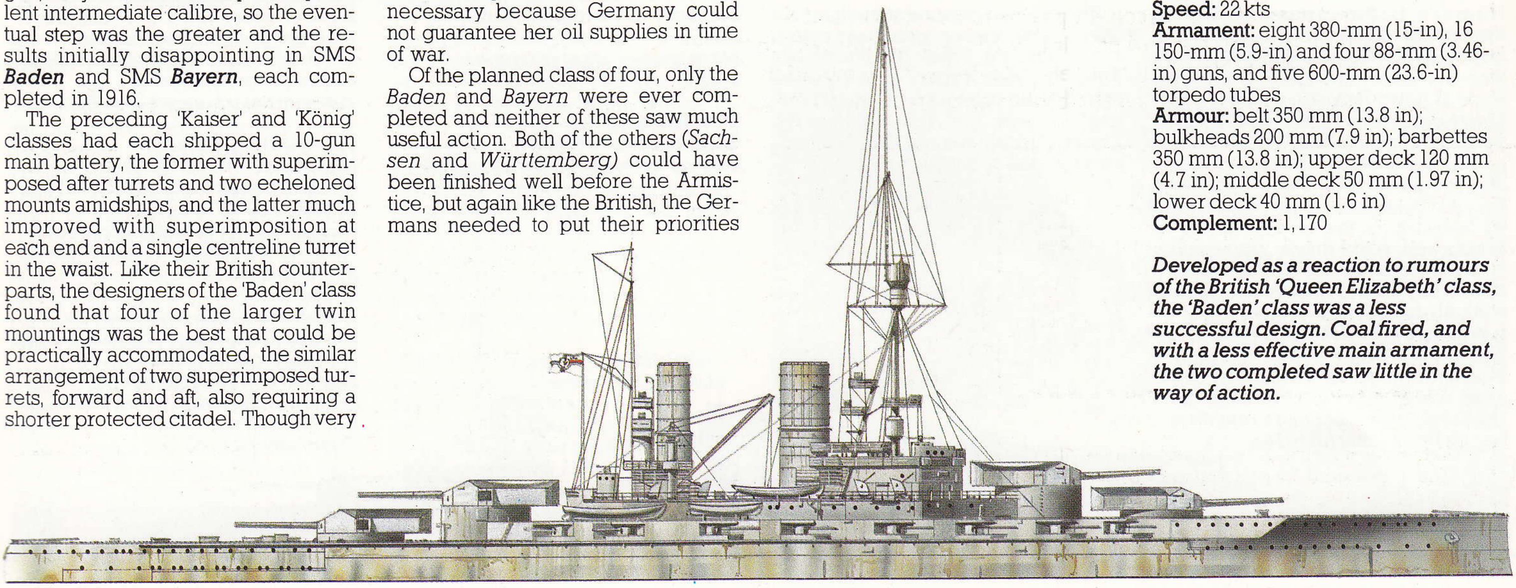
Propulsion: three sets of geared steam turbines delivering 48,000 shp (35794 kW) to three shafts

Speed: 22 kts

Armament: eight 380-mm (15-in), 16 150-mm (5.9-in) and four 88-mm (3.46-in) guns, and five 600-mm (23.6-in) torpedo tubes

Armour: belt 350 mm (13.8 in); bulkheads 200 mm (7.9 in); barbettes 350 mm (13.8 in); upper deck 120 mm (4.7 in); middle deck 50 mm (1.97 in); lower deck 40 mm (1.6 in)

Complement: 1,170



Developed as a reaction to rumours of the British 'Queen Elizabeth' class, the 'Baden' class was a less successful design. Coal fired, and with a less effective main armament, the two completed saw little in the way of action.